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A Continuing Bibliography with Indexes

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NASA SP-7011(206)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 206)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in April 1980 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 169 reports, articles and other documents announced during April 1980 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1980 Supplements.

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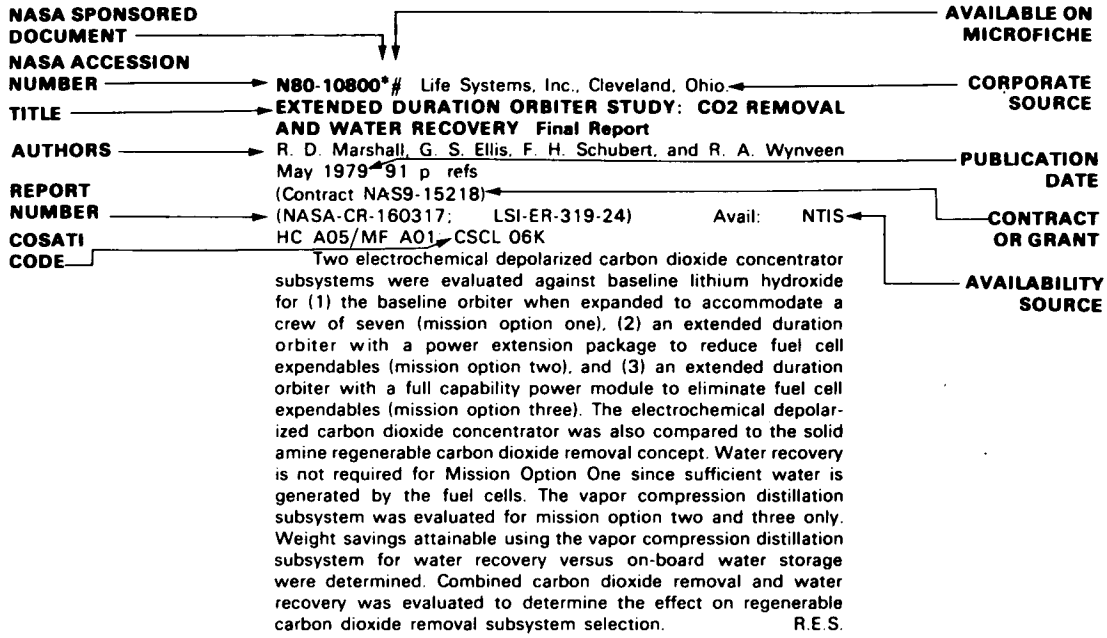

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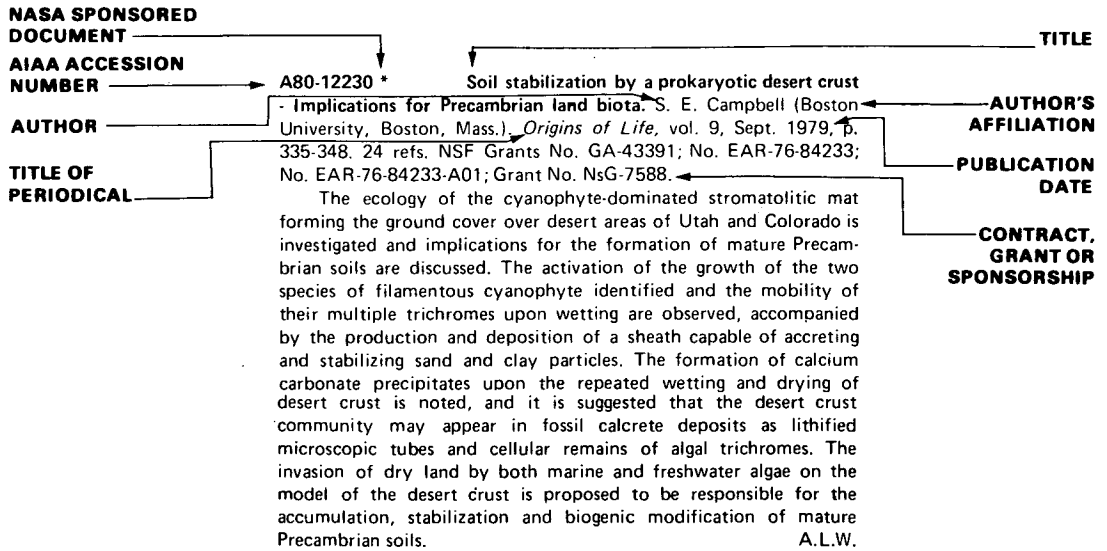

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 206)

MAY 1980

IAA ENTRIES

A80-21094 # **Simulation of walking under conditions of weightlessness (Imitatsiia khod'by v nevesomosti).** V. V. Beletskii and N. S. Konikova. *Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela,* Sept.-Oct. 1979, p. 48-53. In Russian.

The analysis deals with the plane motions of a dynamic biped walking machine consisting of 5 inertial elements: a balancer-body and two identical two-link legs. It is shown that simulation of biped walking under zero-g conditions requires appreciably smaller control moments than in the presence of a gravitational field. V.P.

A80-21421 # **Ecological physiology of the brain (Ekologicheskaia fiziologiia mozga).** N. N. Vasilevskii. Leningrad, Izdatel'stvo Meditsina, 1979. 200 p. 294 refs. In Russian.

Neurophysiological mechanisms of the adaptive activity of the brain are examined. Specifically, attention is given to: (1) adaptive self-regulation and the 'plasticity' of neurodynamic processes, (2) the effects of extreme conditions (including sensory deprivation) on the adaptive plasticity of the brain, (3) operant controlled neural activity, (4) elementary selective response systems, and (5) mechanisms of conditioned reflexes as forms of selective response. B.J.

A80-21539 **Training and acclimatization - Effects on responses to exercise in a desert environment.** C. L. Wells, S. H. Constable, and A. L. Haan (Arizona State University, Tempe, Ariz.). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 105-112. 20 refs.

A80-21540 **Central circulation and metabolism of the healthy man during postural exposures and arm exercise in the head-down position.** O. G. Gazenko, V. I. Shumakov, L. I. Kakurin, V. E. Katkov, V. V. Chestukhin, V. M. Mikhailov, A. Z. Troshin, and V. N. Nesvetov (Ministry of Health of USSR, Institute of Biomedical Problems and Institute of Transplantology and Artificial Organs, Moscow, USSR). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 113-120. 39 refs.

A80-21541 **Comparison of two techniques for the development and maintenance of tracking behavior in monkeys.** D. F. McCoy, S. R. Aeschleman, G. B. Nallan, and G. M. Pace (Kentucky, University, Lexington, Ky.). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 121-125. Grant No. AF-AFOSR-75-2751.

The present study compared two methods by which animal subjects can be taught to perform a pursuit tracking task. Rhesus monkeys were trained to track in order to avoid shock (Method No. 1) or to obtain food (Method No. 2). One animal received training under both procedures. Both techniques were effective; however, the method utilizing shock produced faster learning and more efficient performance. The possible reasons for these differences are discussed along with generality of the results. These methods should have implications for tracking research in which animal models are required. (Author)

A80-21542 **Blockade of the different enzymatic steps in the synthesis of brain amines and memory /CAR/ in hypobaric hypoxic rats treated and untreated with L. Dopa.** F. Boismare, M. Le Poncin-Lafitte, and J. R. Rapin (Rouen-Haute Normandie, Université, Rouen, France). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 126-128. 9 refs.

A80-21543 **Oxygenation and ambient air pressure influences on alcohol-induced nystagmus in rabbits.** L. M. Odkvist (University Hospital, Linkoping, Sweden) and W. J. Oosterveld (Wilhelmina Gasthuis, Amsterdam, Netherlands). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 129-131. 39 refs.

A80-21544 * **Simulated weightlessness - Effects on bioenergetic balance.** J. P. Jordan, H. A. Sykes, J. C. Crownover, C. L. Schatte, J. B. Simmons, II, and D. P. Jordan (Colorado State University, Fort Collins, Colo.). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 132-136. 35 refs. Grant No. NsG-2232.

As a prelude to a flight experiment, an attempt was made to separate energy requirements associated with gravity from all other metabolic needs. The biological effects of weightlessness were simulated by suspending animals in a harness so that antigravity muscles were not supporting the body. Twelve pairs of rats were allowed to adapt to wearing a harness for 5 d. Experimental animals were then suspended in harness for 7 d followed by recovery for 7 d. Control animals were harnessed but never suspended. Oxygen consumption, carbon dioxide production and rate of (C-14)O2 expiration from radio-labeled glucose were monitored on selected days. Food intake and body mass were recorded daily. Metabolic rate decreased in experimental animals during 7 d of suspension and returned to normal during recovery. Although some of the metabolic changes may have related to variation in food intake, simulated weightlessness appears to directly affect bioenergetic balance. (Author)

A80-21545 **Permeability changes in cerebral, iridic, and retinal vessels during experimental decompression sickness in the rat.** T. Tervo, J. Lethosalo, V.-P. Lehto, M. Heino, I. Kantola, and L. A. Laitinen (Finnish Navy; Central Military Hospital I; Helsinki, University, Helsinki, Finland). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 137-141. 29 refs.

A80-21546 Development of Performance Evaluation Tests for Environmental Research /PETER/ - Complex counting test. R. S. Kennedy and A. C. Bittner, Jr. (U.S. Naval Medical Research and Development Command, Naval Aerospace Medical Research Laboratory, New Orleans, La.). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 142-144. 12 refs.

This study is the first in a program to develop a battery of Performance Evaluation Tests for Environmental Research (PETER). Nineteen volunteer subjects were tested daily for three weeks on a complex task requiring the operator to keep simultaneous track of several things with changing states. Average daily performances are reported as well as reliabilities of three main types: (1) internal consistency of the test; (2) sensitivity - the ability to differentiate subjects; and (3) stability - consistency of measurement over repeated sessions. The results showed that, on this task, learning was accomplished quickly, and performance stayed level for three weeks. The cross-trial reliability for this test was found relatively stable after 3 d of practice, with a decline of only r = .94 to r = .79 over 11 d. This task is further noted as having several characteristics which make it particularly suitable for use in environmental research. It is concluded that the complex counting test can be recommended for use in environmental and other time-course research. (Author)

A80-21547 * Physiological response to hyper- and hypogravity during rollercoaster flight. R. J. von Baumgarten, H. Vogel (Mainz, Universität, Mainz, West Germany), G. Baldrighi (Michigan, University, Ann Arbor, Mich.), and R. Thümler (Michigan, University, Ann Arbor, Mich.; Mainz, Universität, Mainz, West Germany). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 145-154. 27 refs. Contract No. NAS2-9466.

Twenty-six healthy male subjects were flown in a Lear jet aircraft through rollercoaster and parabolic weightlessness flight. Eye movements, respiration, and blood volume pulse were recorded on magnetic tape. The same subjects underwent a battery of five vestibular tests in the laboratory on the ground. One subject in each flight was flown in an upright position, the other in a 90 deg forward tilted head position. The forward tilted subjects always reported motion sickness earlier and after fewer rollercoaster maneuvers than the upright-sitting subjects. It is concluded that the susceptibility to changes of X-axis acceleration is higher than to changes of Z-axis acceleration. Correlation was found between the ability to estimate the subjective vertical (modified Müller-Aubert-test), optokinetic nystagmus asymmetries, and susceptibility to rollercoaster flight sickness. (Author)

A80-21548 Effect of alcohol ingestion on man's thermoregulatory responses during cold water immersion. T. Graham and K. Baulk (Guelph, University, Guelph, Ontario, Canada). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 155-159. 23 refs.

A80-21549 Bioman - An improved occupant-crew station compliance modeling system. G. D. Frisch (U.S. Naval Medical Research and Development Command, Naval Aerospace Medical Research Laboratory, New Orleans, La.) and L. A. D'Aulerio (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 160-167. 13 refs. Navy-supported research.

A computerized, three-dimensional model of the human body and aircraft crew station, to be used in evaluating the physical compatibility of crew members with their stations from the points of view of crew performance and safety, is presented. The graphics model uses as input data generated by crew station geometry and occupant dynamic models, as well as human dynamic response data and test track and ejection tower test data. The Cockpit Geometry Evaluation Computer Program System is used to check and transform digitized crew station data, while the Calspan Simulator program is used to simulate occupant response. The human body can be represented graphically as a set of ellipsoids, as in the Calspan program, or by a high-resolution topographic method, taking into account possible head protection. The package is capable of displaying crew responses from omnidirectional inputs from any perspective, thus making it applicable to aircraft ejections, carrier arrested landings and ditchings, the design of the crew station interiors, and other crew enclosures. A.L.W.

A80-21550 The effect of propranolol on human psychomotor performance. A. D. Broadhurst (West Suffolk Hospital, Bury St. Edmunds, England). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 176-179. 24 refs.

Despite their widespread usage the effect of beta blockers on human performance has been only sparsely studied and results of investigations are discrepant. This study examines the effect of one of the most commonly prescribed beta adrenergic blocking drugs, propranolol, on psychomotor function. To demonstrate the sensitivity of the test method and to provide some basis for comparison, the effect of small doses of sodium amylobarbitone on psychomotor performance is also measured. Results indicate that propranolol in a single dose of 40 mg produces a small but significant decrement of performance, an effect comparable to that of 25 mg of sodium amylobarbitone. Habituation to chronic administration of propranolol at a daily dose level of 120 mg is also apparent. The clinical significance of these effects, particularly in aviation medicine, is discussed. (Author)

A80-21551 Trapped gas dysbarism requiring recompression therapy. R. Bason, T. Wilson, and J. Etheredge ((U.S. Navy, Naval Air Station, Norfolk, Va.). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 180-181. 11 refs.

A case history of trapped gas dysbarism (barotrauma) requiring recompression therapy is presented to demonstrate the severity of the syndrome. Following exposure to a simulated altitude of 40,000 ft in a low-pressure chamber, a 27-year old male reported nausea, abdominal cramping and a sense of detachment from his surroundings. A tentative diagnosis of dysbarism-pain only-persistent was made, which was later changed to barotrauma (trapped intestinal gas). A Table 5 recompression schedule was subsequently employed in a hyperbaric facility to a depth of 60 ft, after 22 min of which the symptoms disappeared. Intermittant mild abdominal cramping was then experienced over the next 12 days, after which the patient was asymptomatic. It is concluded that flight surgeons and physiologists must be aware of the potentially severe complications of barotrauma as well as of decompression sickness. A.L.W.

A80-21552 The 1976 accident experience of civilian pilots with static physical defects. J. R. Dille and C. F. Booze (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 182-184. 5 refs.

The paper reports on aircraft accident experience of civilian pilots with physical defects in 1976. It was found that pilots with blindness in either eye or absence of either eye, deficient color vision with a waiver, and deficient distant vision had significantly more accidents than were expected on the basis of observed-to-expected ratios. The accident rates were calculated in 1975, and the rates for airmen with blindness in one eye or absence of an eye were found to be significant; the observed-to-expected ratios for 1976 were 1.91 for deficient color vision with a waiver, 1.28 for contact lens users, 1.37 for blindness in- or absence of either eye, and 1.62 for deficient distant vision. Finally, it was shown that the accident rates per 100,000 h of cumulative and last 6 months flying experience were significantly greater for contact lens users and monocular pilots than for the active airman population. A.T.

A80-21553 * An ultrasonic plethysmograph for space flight applications. P. K. Bhagat, J. F. Lafferty, D. Bowman, and M. P. Kadaba (Kentucky, University, Lexington, Ky.). *Aviation, Space, and Environmental Medicine,* vol. 51, Feb. 1980, p. 185-188. 14 refs. Contracts No. NAS9-14392; No. NAS9-15452.

The development of an ultrasonic plethysmograph based on the transit time measurement principle is reported, which meets the space-imposed requirements for evaluating cardiovascular decon-

ditioning. It consists of a pulse generator, pulse receiver amplifier, voltage comparator, synchronous pulse generator, elapsed time counter, and transmit and receive piezoelectric crystals resonant at 2 MHz and of 3 mm diameter. The transit time for an ultrasonic pulse to propagate across a limb cross section is computed in a digital fashion using a 32 MHz clock, and resolution is 0.049 mm with the range being approximately 200 mm. Experimental results regarding dynamic system response were found comparable in both accuracy and sensitivity to those of a Whitney strain gage using a 50 torr venous occlusion. J.P.B.

A80-21781 'Acetonitrile' - A plausible source of amino acids on the primitive earth. A. K. Pant, D. D. Melkani, and H. D. Pathak (Kumaun University, Naini Tal, India). *British Interplanetary Society, Journal (Interstellar Studies),* vol. 32, June 1979, p. 223-227. 27 refs.

Acetonitrile, under mild hydrolytic conditions, gives rise to a number of ninhydrin positive compounds, some of which are of biological significance. The compounds identified include lysine, aspartic acid, serine, glycine, alpha-alanine and leucine. Metal oxide sensitizers remarkably affect the formation of amino acids. Since acetonitrile is easily formed by sparking a mixture of methane and ammonia, the main constituents of the primitive atmosphere, it is likely that it may have played a role in chemical evolution. (Author)

A80-21851 # An evaluation of heart rate during activity of high psychological and physiological stress (Zur Beurteilung der Herzschlagfrequenz bei psycho-physisch hoch belastenden Tätigkeiten). U. Philipp. Darmstadt, Technische Hochschule, Fachbereich Maschinenbau, Dr.-Ing. Dissertation, 1979. 187 p. 210 refs. In German.

The work examines the selection and testing of methods that determine heart rate on the basis of working condition examinations under various stress factors. These methods include the application of central nervous system functions and the simulation studies of processes to scaling and measuring heart rate with respect to stress reaction. The application of these techniques in engineering is examined and some examples are tested, whose results can help to determine the evaluation of heart rate under various stress conditions. C.F.W.

A80-21982 * Microbial sulfate reduction measured by an automated electrical impedance technique. R. S. Oremland and M. P. Silverman (NASA, Ames Research Center, Extraterrestrial Biology Div., Moffett Field, Calif.). *Geomicrobiology Journal,* vol. 1, no. 4, 1979, p. 355-372. 27 refs.

Electrical impedance measurements are used to investigate the rates of sulfate reduction by pure cultures of and sediments containing sulfur-reducing bacteria. Changes in the electrical impedance ratios of pure cultures of Desulfovibrio aestuarii and samples of reduced sediments from San Francisco Bay were measured by a Bactometer 32, and sulfate reduction was followed by measuring the incorporation of (S-35) sulfate into metal sulfides. The growth of the bacteria in pure culture is found to result in an increase of 0.2200 in the impedance ratio within 24 h, accompanied by increases in protein, ATP, sulfide and absorptance at 660 nm, all of which are inhibited by the addition of molybdate. Similar responses were observed in the sediments, although impedance ratio responses were not completely inhibited upon the addition of molybdate, due to the presence of nonsulfate-respiring microorganisms. Experiments conducted with sterile media and autoclaved sediments indicate that the presence of H2S together with iron is responsible for the impedance effect, and sulfate reduction rates ranging between 0.85 and 1.78 mmol/l per day are estimated for the sediments by the impedance technique. A.L.W.

A80-21984 * Residual nutational activity of the sunflower hypocotyl in simulated weightlessness. D. K. Chapman and A. H. Brown (Pennsylvania, University, Philadelphia, Pa.). *Plant and Cell Physiology,* vol. 20, no. 2, 1979, p. 473-478. 19 refs. Grants No. NGR-39-010-149; No. NGR-39-030-010; Contract No. NAS9-15340.

The gravity dependence of circumnutational activity in the sunflower hypocotyl is investigated under conditions of simulated weightlessness. Seedling cultures of the sunflower Helianthus annuus were placed four days after planting in clinostats rotating at a rate of 1.0 rpm in the horizontal or somersaulting configurations, and plant movements around their growth axes were recorded in infrared light by a time-lapse closed-circuit video system. The amplitudes and mean cycle durations of the plant nutations in the horizontal and tumbling clinostats are observed to be 20% and 72%, and 32% and 74%, respectively, of the values observed in stationary plants; extrapolations to a state of zero g by the imposition of small centripetal forces on horizontally clinostated plants also indicate some nutational motion in the absence of gravity. It is concluded that the results are incompatible with the model of Israelsson and Johnsson (1967) of geotropic response with overshoot for sunflower circumnutation; however, results of the Spacelab 1 mission experiment are needed to unambiguously define the role of gravitation. A.L.W.

A80-21988 * Noninvasive measures of bone bending rigidity in the monkey /M. nemestrina/. D. R. Young, W. H. Howard, C. Cann (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.), and C. R. Steele (Stanford University, Stanford, Calif.). *Calcified Tissue International,* vol. 27, Mar. 1979, p. 109-115. 23 refs.

The in vivo bending rigidity and bone mineral content of monkey ulnae and tibiae were measured. Bending rigidity in the anteroposterior plane was measured by an impedance probe technique. Forced vibrations of the bones were induced with an electromechanical shaker, and force and velocity at the driving point were determined. The responses over the range of 100-250 Hz were utilized to compute the bending rigidity. Bone mineral content in the cross section was determined by a photon absorption technique. Seventeen male monkeys (Macaca nemestrina) weighing 6-14 kg were evaluated. Bending rigidity was correlated with the mineral content of the cross section, with a correlation coefficient of 0.899. Two monkeys were evaluated during prolonged hypodynamic restraint. Restraint produced regional losses of bone most obviously in the proximal tibia. The local bone mineral content declines 17 to 24% and the average bending rigidity declines 12 to 22%. Changes in bones leading to a reduction in mineral content and stiffness are discussed. (Author)

A80-22124 The effects of long-term intoxication by the inhalation of gaseous HF on myocardial cell metabolism and serum cardiac enzyme levels in guinea pigs (Effets de l'intoxication à long terme par inhalation de HF gazeux sur le métabolisme des cellules du myocarde et les taux sériques d'enzymes cardiaques de cobayes). P. Bourbon, J. Poey, C. Rioufol, M. Saouthi, and C. Phillibert (Institut National de la Santé et de la Recherche Médicale, Vigoulet-Auzil, Haute-Garonne; Toulouse III, Université, Toulouse, France). *Pollution Atmosphérique,* vol. 21, Oct.-Dec. 1979, p. 323-326. 10 refs. In French.

A80-22840 # Some problems of space medicine and international manned space flights (Wybrane zagadnienia medycyny kosmicznej a miedzynarodowe kosmiczne loty zalogowe). N. N. Gurovskii, A. D. Egorov (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR), and S. Baranski (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postepy Astronautyki,* vol. 12, no. 3, 1979, p. 7-20. In Polish.

The effects of weightlessness on the human body are reviewed. Particular consideration is given to the activity of the vestibular, cardiovascular, and muscular systems under weightlessness. A model of adaptation to weightlessness is presented. The readaptation of the human body to normal gravity on the earth's surface, means of protecting the body against the negative effects of weightlessness, and the problem of rest during prolonged space flight, are also treated. Data on the performance of astronauts aboard the Salyut 6 station are examined. B.J.

A80-22967 **Adapting to two orientations - Disinhibition in a visual aftereffect.** S. Magnussen and W. Kurtenbach (Freiburg, Universität, Freiburg im Breisgau, West Germany). *Science,* vol. 207, Feb. 22, 1980, p. 908, 909. 16 refs. Research supported by the Alexander von Humboldt- Stiftung and Norges Almenvitenskapelige Forskningsrad; Deutsche Forschungsgemeinschaft Contract No. SFB-70.

The tilt aftereffect of adapting to two different orientations simultaneously is weaker than the aftereffect of adapting to the more effective of the two orientations alone. This finding is consistent with explanations of orientational aftereffects in terms of lateral inhibition between cortical orientation detectors, but not with explanations in terms of neural 'fatigue' from excitation. (Author)

A80-22969 **Linear summation of tilt illusion and tilt aftereffect.** S. Magnussen and W. Kurtenbach (Freiburg, Universität, Freiburg im Breisgau, West Germany). *Vision Research,* vol. 20, no. 1, 1980, p. 39-42. 28 refs. Research supported by the Alexander von Humboldt-Stiftung and Norges Almenvitenskapelige Forskningsrad; Deutsche Forschungsgemeinschaft Contract No. SFB-70.

A comparison of the tilt aftereffect (TAE) and the simultaneous tilt illusion (TI) revealed very similar angular functions. When an aftereffect and a simultaneous illusion of opposite signs were paired by first adapting to a clockwise orientation and then presenting the vertical test line together with a counterclockwise inducing line, the two effects summed linearly. The results suggest a unitary mechanism of TAE and TI, and are consistent with the hypothesis that they are manifestations of lateral inhibition between orientation detectors. (Author)

A80-22970 **Additivity of fusional vergence and pursuit eye movements.** J. M. Miller, H. Ono, and M. J. Steinbach (York University, Downsview, Ontario, Canada). *Vision Research,* vol. 20, no. 1, 1980, p. 43-47. 10 refs. National Research Council of Canada Grants No. A-0296; No. A-7664.

We measured binocular eye movements photoelectrically while subjects tracked a target moving smoothly along a horizontal path in the fronto-parallel plane, with interpolated step changes in depth. By measuring eye movement speeds when only fusional vergence or only pursuit was required we were able to ascertain how the vergence and pursuit movements combined when called out together. When the two were in opposite directions the net eye movement speed was equal to the difference of the vergence and pursuit components, reflecting perfect additivity. When vergence and pursuit were in the same direction a significant deviation from strict additivity was found, i.e. the combined eye movements were on average 11% slower than expected. We speculate that this attenuation may be peripheral in origin. (Author)

A80-22971 **Information used by the perceptual and oculomotor systems regarding the amplitude of saccadic and pursuit eye movements.** J. M. Miller (New School for Social Research, New York, N.Y.). *Vision Research,* vol. 20, no. 1, 1980, p. 59-68. 33 refs. Grant No. NIH-16327-09.

Measures were designed to assess the steady-state information about amplitude of eye movement used for performance of a visual localization task and for control of voluntary saccades. Each measure was applied to four experimental eye movement situations: a saccade in the dark, a saccade to a visible target, a single half-cycle, and the last of 5 half-cycles of pursuit of a target moving in a straight path with sinusoidal velocity at 0.33 Hz. The data indicate that, concerning a just-completed eye movement, (1) information available for control of voluntary saccades is no different from that used to perform a visual localization task, (2) pursuit of a target moving repetitively over a path is subject to considerable underestimation (33%) compared to pursuit of a single sweep of target motion (11% underestimation) and (3) retinal information concerning 'intended' saccade amplitude is utilized in judging the amplitude of the saccade which actually occurs. The ERS alone, however, is quite accurate and underestimates saccade amplitude by less than 4%. (Author)

A80-22972 **A two-stage identification scheme for the determination of the parameters of a model of left heart and systemic circulation.** J. W. Clark, Jr. (Rice University, Houston, Tex.), R. Y. S. Ling (McDonnell Douglas Corp., Houston, Tex.), R. Srinivasan (South Carolina, Medical University, Charleston, S.C.), J. S. Cole (Baylor College of Medicine, Houston, Tex.), and R. C. Pruett (Arco Oil, Plano, Tex.). *IEEE Transactions on Biomedical Engineering,* vol. BME-27, Jan. 1980, p. 20-29. 28 refs. NSF Grant No. ENG-77-17987.

A80-22985 # **Calorimetric measurements of microwave energy absorption by mice after simultaneous exposure of 18 animals.** S. J. Allen and W. D. Hurt (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 1-4.

A multiple-cell calorimetric system was constructed, and the experimental procedure for its use was developed. An associated data-readout system is small, relatively inexpensive, and provides automated thermistor calibration, precise temperature measurements, and a printout of whole-body SARs. One system was used to determine the SAR of each of 18 mice that were simultaneously exposed to 2.6-GHZ radiation. (Author)

A80-22987 * **Part-body and multibody effects on absorption of radio-frequency electromagnetic energy by animals and by models of man.** O. P. Gandhi, M. J. Hagmann, and J. A. D'Andrea (Utah, University, Salt Lake City, Utah). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 15-21. 10 refs. Grant No. DAMD17-74-C-4092; Contract No. NAS2-9555.

Fine structure in the whole-body resonant curve for radio-frequency energy deposition in man can be attributed to part-body resonances. As for head resonance, which occurs near 350 MHz in man, the absorptive cross section is nearly three times the physical cross section of the head. The arm has a prominent resonance at 150 MHz. Numerical solutions, antenna theory, and experimental results on animals have shown that whole-body energy deposition may be increased by 50 percent or more because of multiple bodies that are strategically located in the field. Empirical equations for SARs are also presented along with test data for several species of laboratory animals. Barbiturate anesthesia is sufficiently disruptive of thermoregulation that delta Ts of colonic temperature yield energy dose values in several mammals that compare quite favorably with those based on whole-body calorimetry. (Author)

A80-22988 **A geometrical-optics and an exact solution for internal fields in and energy absorption by a cylindrical model of man irradiated by an electromagnetic plane wave.** H. Massoudi, C. H. Durney (Utah, University, Salt Lake City, Utah), and C. C. Johnson. *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 35-42. 23 refs.

A geometrical-optics approximation was used to calculate the mass-normalized rate of RF energy absorption (the specific absorption rate or SAR) in cylindrical models of man and in experimental animals irradiated by an electromagnetic (EM) plane wave at high radio frequencies. Comparison of these results with corresponding geometrical-optics calculations for prolate spheroidal models showed that the relative absorptive cross section of the prolate spheroidal and cylindrical models of man are essentially the same at frequencies above 20 GHz. The exact solution for the SAR in a lossy, infinitely long homogeneous circular cylinder exposed to an electromagnetic plane wave, for perpendicular incidence and with the incident E field both perpendicular and parallel to the axis, is also given. Curves showing SAR versus frequency for cylindrical models of man and animals in comparison with composite curves obtained from prolate spheroidal calculation are presented. It is shown that the exact solution for SARs in cylindrical models of animals and human beings appears to be a good approximation in the frequency range just below the geometrical-optics limit, thus providing an important method for extending the calculation of SARs into a range of frequencies where calculations were not available previously. (Author)

A80-22989 Heating of spherical versus realistic models of human and infrahuman heads by electromagnetic waves. S. Rukspollmuang and K.-M. Chen (Michigan State University, East Lansing, Mich.). *Radio Science,* vol. 14, Nov.-Dec., 1979, p. 51-62. 9 refs. NSF Grant No. ENG-74-12603; Grant No. DAAG29-76-G-0201.

A numerical method based on a tensor integral equation has been employed to quantify the induced EM heating in realistic models of the human and infrahuman head. The head consists of a brain of realistic shape and eyes that are surrounded by bone structure. The numerical method has also been used to determine the induced EM heating in spherical models of human and infrahuman heads and brains. The EM heating induced in the brain of the realistic model is lower than that induced in the brain of the spherical model. The bony structure of the skull tends to attenuate heating of the brain, including the eyes. (Author)

A80-22990 Circularly polarized 2450-MHz waveguide system for chronic exposure of small animals to microwaves. A. W. Guy, J. Wallace, and J. A. McDougall (Washington, University, Seattle, Wash.). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 63-74. U.S. Rehabilitation Services Administration Grant No. 16-P-56818; Grant No. NIH-N01-ES-6-2133.

A80-22992 # Induction of calcium-ion efflux from brain tissue by radio-frequency radiation - Effects of modulation frequency and field strength. C. F. Blackman, J. A. Elder, C. M. Weil, S. G. Benane, D. C. Eichinger, and D. E. House (U.S. Environmental Protection Agency, Health Effects Research Laboratory, Research Triangle Park, N.C.). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 93-98. 28 refs.

A80-22993 Extremely-low-frequency fields and the slime mold Physarum polycephalum - Evidence of depressed cellular function and of internuclear interaction. B. Greenebaum, E. M. Goodman, and M. T. Marron (Wisconsin, University, Kenosha, Wis.). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 103-107. 12 refs. Navy-supported research.

The acellular slime mold Physarum polycephalum has been exposed continuously to a variety of low-level, extremely-low-frequency (ELF) fields for periods ranging from two months to five years. Changes in several biological parameters have been observed that are significant (P less than 0.05) and reproducible. Cultures were exposed to 75-, 60-, and 45-Hz CW, and 76-Hz frequency-modulated fields. Electric-field intensities ranged from 0.04 to 0.7 V/m (rms); magnetic fields, from 0.01 to 0.2 milliteslas (rms). The observed changes are generally those of a slowing of cellular processes. A longer nuclear-division cycle and depressed respiration rate have been seen under exposure to most CW fields and to all frequency-modulated fields that have been tested. Additional experiments indicate that lengths of the nuclear-division cycle of cultures formed by mixing exposed and control samples lie between those of control and exposed cultures. Indirect measurements of chromosomal numbers of this polyploid organism indicate no statistically significant difference between exposed and control nuclei. (Author)

A80-22994 Models of long-range order in cerebral macromolecules - Effects of sub-ELF and of modulated VHF and UHF fields. A. R. Sheppard, S. M. Bawin, and W. R. Adey (California, University, Los Angeles, Calif.). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 141-145. 31 refs. NSF Grant No. GB-27740; Grant No. PHS-3-R01-FD-678-03; Contract No. N00014-75-1094.

Weak RF fields (450 MHz) that were sinusoidally modulated at 16 Hz increased the efflux of calcium ion from freshly isolated chick brain. The data demonstrate upper and lower bounds for power levels of incident fields at which the change of efflux is observed. These bounds, between 0.05 mW/sq cm and 2.0 mW/sq cm, constitute an amplitude window for the calcium-efflux effect, which is also characterized by a frequency window demonstrated in previous experiments. The mechanisms by which weak low-frequency fields - or weak high-frequency fields modulated at sub-ELF rates - interact with biological tissue derive from the properties of the biological components of neuronal membrane and from the unique dielectric properties of biological tissues in fields that oscillate at brain-wave frequencies. (Author)

A80-22995 # Contraction of smooth muscle in a microwave field. E. R. Whitcomb, C. F. Blackman, and C. M. Weil (U.S. Environmental Protection Agency, Health Effects Research Laboratory, Research Triangle Park, N.C.). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 155-158. 7 refs.

Spontaneous contractions of smooth muscle were observed during microwave irradiation. Isolated gut segments of adult male albino rats were exposed to 1-GHz, continuous-wave radiation by means of a capacitive-plate exposure system. For stabilization, the gut segment was maintained initially at 7 C for one hour and then at 36 C for one hour in a modified Ringer's solution prior to irradiation. During recording of contractions the gut segment was suspended in a 10-ml plastic tube and was bathed by Ringer's solution (pH 7.5) at 36 C at a flow rate of 6 ml/min from a 500-ml reservoir. Contractions were measured by a strain gauge. Frequency distributions of 500 contractions each were made before and during a single exposure and were displayed as interval-histogram patterns. Four gut preparations were exposed to radiation at intensities that resulted in specific absorption rates of either 1.2, 2.3, or 6.9 mW/g. For each absorption rate the response patterns for the four gut preparations representing a before-exposure (control) condition were summed and compared with the summed response patterns of the same preparation during exposure. No effect of irradiation by electromagnetic energy on the rate of spontaneous contractions of smooth muscle was observed. (Author)

A80-22996 # Operant behavior and rectal temperature of squirrel monkeys during 2.45-GHz microwave irradiation. J. de Lorge (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 217-225. 13 refs.

The paper examines the operant behavior and rectal temperature of squirrel monkeys during 2.45-GHz microwave irradiation. Four monkeys were exposed for 30 min during two-hour sessions, and three monkeys were exposed for 60 min during two-hour sessions. The animals were restrained in styrofoam chairs and the exposures were made in a microwave-anechoic chamber. The behavior of the monkeys in the observing-response task was disrupted only at power densities of 50 mW/sq cm and higher, and their behavior was not consistently perturbed until the rectal temperatures increased by more than 1 C. The rectal temperature was slightly elevated at 10 mW/sq cm, it was a monotonic function of the power density, and was markedly increased at power densities between 40 and 50 mW/sq cm. A.T.

A80-22997 # Skilled visual-motor performance by monkeys in a 1.2-GHz microwave field. D. M. Scholl and S. J. Allen (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Radio Science,* vol. 14, Nov.-Dec. 1979, Supplement, p. 247-252. 27 refs.

Three young adult rhesus monkeys (Macaca mulatta) were exposed to radio-frequency electromagnetic radiation (RFR) at average power densities of 10 and 20 mW/sq cm, which resulted in respective SARs of 0.8 and 1.6 W/kg. Exposure sessions took place at two-day intervals until completion of three 120-minute exposures at each power level; 1.2-GHz continuous-wave (CW) irradiation was centered on a subject's head with the E-field vector parallel to the horizontal plane of the cranium. The monkeys performed a compensatory visual-tracking task with alternating periods of work and rest of 1.5-minute duration before and during exposure to radiation. During a work period, the task required continuous visual vigilance and skilled motor performance. The animals were motivated by mild electrical stimulation to maintain a circular cursor within the center 15% of an oscilloscopic display. The cursor was driven off this safe on-target area by a complex sinusoidal track that covered 40% of the display. Control data were used to establish 95% simultaneous confidence limits for the adjusted root mean square (ARMS) of tracking errors. The ARMS values from exposure sessions showed no decrement relative to control data. It is concluded that the exposures

at 10 and 20 mW/sq cm did not have deleterious effects upon the skilled performance of a moderately large primate. (Author)

A80-23047 * Loudness enhancement and decrement in four paradigms. R. Elmasian, R. Galambos, and A. Bernheim, Jr. (California, University, La Jolla, Calif.). *Acoustical Society of America, Journal*, vol. 67, Feb. 1980, p. 601-607. 35 refs. Grants No. NIH-MH-15828; No. NGR-05-009-198; No. NIH-NS-10482.

When one tone burst (the conditioner) preceeds another (the target) by 100 ms, target loudness is enhanced if the conditioner is more intense and decreased if it is less intense. We show here that similar loudness enhancements and decrements occur when the conditioner .follows the target. In all instances, monaural loudness enhancements (in which the conditioner and target are delivered to the same ear) are greater than the dichotic enhancements (in which the conditioner is presented contralaterally), but the decrements, which are smaller than the enhancements, are similar in magnitude. Loudness enhancements and decrements are similar to sequential loudness effects and central tendency effects; the major difference is the relatively very large increases in loudness obtainable in loudness enhancement experiments. We outline a mechanism to account for these loudness phenomena and suggest that this mechanism is responsible for similar perceptual effects that occur in other stimulus dimensions and modalities. (Author)

A80-23079 # Physiological and hygienic aspects of the effects of high and low temperatures (Fiziologo-gigienicheskie aspekty deistviia vysokikh i nizkikh temperatur). A. N. Azhaev. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 38), 1979. 264 p. 725 refs. In Russian.

The work examines the effects of low and high temperature microclimates on animals and man. Attention is given to the influence of convective, radiative, and conductive heat transfer on body thermoregulation, the salt metabolism, the cardiovascular system, and the respiratory system. Ways to protect flight crews from extremes of heat and cold are discussed, and the design of thermoregulation systems is examined. Finally, a classification of the thermal states of the human body is presented. B.J.

A80-23208 Aircrew stress in wartime operations. Edited by E. J. Dearnaley (Manchester, Victoria University, Manchester, England) and P. B. Warr (Medical Research Council, Social and Applied Psychology Unit, Sheffield, England). London and New York, Academic Press, 1979. 230 p. $20.

Papers concerning the reactions of air crews to the stress associated with wartime operations during World War II are presented. Specific topics include the historical background to wartime psychological research in the Royal Air Force, neurosis precipitated by flight duties, the influence of psychological disorders on operational flight efficiency, fluctuations in navigator performance during bombing sorties, physical and psychological measures of the effects of operational stress on bomber crews, the relation of landing accidents to pilot fatigue, the psychological aspects of airsickness, and experimental studies of mental fatigue and pilot error. A.L.W.

A80-23209 The historical background to wartime research in psychology in the Royal Air Force. D. D. Reid. In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 1-8. 8 refs.

A personal account of the circumstances in World War II leading to research by the Royal Air Force on the psychological and psychiatric aspects of operational flying during wartime is presented. Attention is given to the background of medical personnel in the psychology of flight crews and the morale and neurotic conditions of bomber crews encountered in the early years of the war. The prevention of pilot breakdown by the subsequent selection during training of persons not predisposed to psychological problems and the limitation of operational tours of duty are discussed, and preliminary results obtained concerning the effects of fatigue, anxiety and temperament on pilot efficiency during flight operations are indicated. It is concluded, however, that improvements in crew morale after 1942 were probably due as much to operational success in flight activities as to the efforts of the medical service. A.L.W.

A80-23210 Clinical and statistical study of neurosis precipitated by flying duties. C. P. Symonds and D. J. Williams. In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 9-41. 17 refs.

The 2200 cases of psychological disorder in flying personnel resulting from flying duties encountered by Royal Air Force psychiatrists during the year ending February 9, 1943, are analyzed by patient flying hours, type of duty, aircraft, diagnosis and causal factors. It is shown that nearly half of all cases arose in pilots, with pilots, wireless operators, air gunners and navigators making up 96% of the total and pilots making up the bulk of cases in all commands except bomber. When normalized to man-years in commands, it is found that the breakdown rate was greatest in air gunners and in bomber command. The incidence of neurosis is found to be directly related to the danger of the flight duty and to the patients' predisposition to neurosis. The major single cause in all the disorders is found to have been fear, with fatigue, physical injury, illness, airsickness and exhaustion playing minor roles. Nearly 80% of the patients referred were diagnosed to be suffering from anxiety states, with lesser numbers attributed to hysteria, depression and fatigue. Of the patients seeing psychiatrists, 38% returned to flying, with a relapse rate of 5% within a year, while 56% of those for whom an intermediate period of ground duty or limited flying was recommended returned to flying. A.L.W.

A80-23211 The influence of psychological disorder on efficiency in operational flying. D. D. Reid. In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 43-62. 13 refs.

The influence of psychological disorders on aircrew efficiencies during wartime operations is investigated. Two hundred members of bomber air crews were interviewed upon their arrival at an operational station, and estimates of their predisposition to neurosis or problems with operational flight were compared with their actual flight records after 30 operations. It is found that a large percentage of the group considered predisposed to psychological problems (69%) actually suffered mental breakdowns during the period of service, while those predisposed who did not break down were considerably more likely to end up as casualties (20%) than to survive their tours of duty (5%). The various types of neurotic disorders encountered and the circumstances leading to their expression are illustrated by case histories, and implications of psychological predispositions for the preselection and reassignment of persons suffering breakdowns are discussed. A.L.W.

A80-23212 Fluctuations in navigator performance during operational sorties. D. D. Reid. In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 63-73.

The errors made by navigators engaged in night bomber sorties in the calculation and plotting of wind vectors are analyzed in order to investigate the possible influence of psychological factors on aircrew efficiency under wartime operational conditions. Fluctuations in navigator performance are compared with the times of occurrence of acute hazards along the routes to and from the targets and in regions where opposition was encountered. Considerable variations in navigator efficiency are found, with errors reaching a maximum during and after enemy opposition and falling on the route back to base. It is suggested that these fluctuations are due to the successive effects of anticipatory, acute and persistent anxiety, which are greater than the effects of fatigue. The results are used to explain variations observed between aircrew performances observed during training and operations, and the importance of selecting personnel who are stable under stress for key operational positions is emphasized. A.L.W.

A80-23213 **Some measures of the effect of operational stress on bomber crews.** D. D. Reid. In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 75-88.

Physiological and psychological measurements of the effects of operational wartime stress on bomber crews are reported as part of an investigation of the optimal tour of duty for operational flying personnel. The mean weight of bomber crews is shown to decrease during the first third of a 30-mission tour, remaining at this decreased level to the end. This decrease is not explained by selective elimination, and it is suggested that it may be due to the anxiety associated with operational stress. Increases in the numbers of men reporting sick and suffering psychological disorders during the same period are also observed, and a period of relative stability in the latter period of the tour due to an adaptation to stress is indicated. It is concluded that the first tour of 30 missions is no longer than can be performed without significant deterioration in health, and the level of weight loss observed may provide a baseline against which to judge larger deviations when diagnosing anxiety states. A.L.W.

A80-23214 **An investigation of landing accidents in relation to fatigue.** A. B. Hill and G. O. Williams. In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 89-108.

The effects of fatigue on pilot landing performance are investigated for the case of bomber pilots returning after sorties of different durations. Statistics on accidents occurring during landings which were not forced or due to enemy action, recorded from April 1940 to March 1942 at RAF Bomber Command after night operations of one to ten hours, were compared. A rather high accident rate is found for sorties of under two hours or greater than 10 hours, most likely due to the difficulties leading to the recall or return of the aircraft in the former case and pilot fatigue in the latter. Within the relatively long interval of two to ten hours, within which most flights were made, there is no evidence of increasing pilot fatigue having lead to increased landing accident rates, indicating that pilots have managed to overcome the effects of the fatigue observed in laboratory experiments sufficiently to avert reportable landing accidents. A.L.W.

A80-23215 **The psychological aspects of airsickness.** C. P. Symonds and D. J. Williams. In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 109-134. 10 refs.

The influence of psychological factors in the suspension of aircrew from flight duties due to airsickness is investigated. Interviews of 120 men to be suspended from Flying Training Command or Bomber Command in the RAF during wartime operations were conducted in order to determine the nature of the disability, the patient's past history of motion sickness, psychiatric history and attitude toward flying. Neurosis was judged to be present in 7.5% of the cases interviewed, with a predisposition to neurosis recognized in 42.5% and contributing to the airsickness in half of those cases. In only three cases was poor morale judged to be the major contributing factor in the development of airsickness. Constitutional motion sickness was recognized in 84% of the cases. It is concluded that the cause of suspension for airsickness in most cases is motion sickness uncomplicated by psychological factors. Psychological factors may contribute to airsickness by lowering the physiological motion tolerance or reducing the ability or willingness to endure symptoms. It is recommended that a standard method for recording airsickness be adopted for all crew members during each phase of their training in order to facilitate judgments of flight fitness. A.L.W.

A80-23216 **An experimental study of mental fatigue.** G. C. Drew. In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 135-177.

The changes in human behavior occurring in a situation expected to bring about mental fatigue are investigated. Pilot trainees were asked to perform a fixed set of maneuvers in a cockpit simulator, and the responses were scored. After two hours of testing, subjects reported the subjective malaise characteristic of fatigue, and significant deteriorations of side-slip, air speed, altitude and directional performance were observed. The deterioration is attributed to a general lowering of standards as the test progresses, an increase in the magnitude of the errors made, the disregard of relationships between actions, difficulties with the artificial horizon, and increasing irritability. Other effects observed include unreliability of pilot reports on what had occurred during the test, a growing awareness of physical discomfort, forgetting to monitor minor instruments, and the appearance of entirely abnormal and inappropriate responses. Means of preventing the development of mental fatigue in operational situations are suggested. A.L.W.

A80-23217 **Pilot error - Some laboratory experiments.** D. R. Davis (Medical Research Council, Applied Psychology Research Unit, Cambridge, England). In: Aircrew stress in wartime operations. London and New York, Academic Press, 1979, p. 179-218. 13 refs.

Results of a series of laboratory experiments on the nature and causes of pilot error are presented, and the theory is advanced that the tendencies responsible for the errors made in the tests are also responsible for flight errors which lead to accidents. The incidence of pilot errors was studied in the Cambridge Cockpit flight simulator under various conditions of noise, drugs and pilot instructions. The number of errors was observed generally to increase in the first half hour of the test, reach its maximum in the second half hour and then decline, with the duration and size of errors increasing as the test progressed. Errors were attributed to successive overaction, inattention, a specific end effect, preoccupation with one part of the task and perceptual disorganization. Performance was also affected by alcohol, amphetamine, noise, and special instructions describing the types of error to which pilots are liable. The errors encountered are explained as due to variations of anticipatory tension rather than fatigue, and are found to be correlated with the subsequent flight careers of the subjects. A.L.W.

A80-23745 **Deposition of hygroscopic atmospheric aerosol particles in the human respiratory tract.** G. Hänel (Frankfurt, Universität, Frankfurt am Main, West Germany) and J. Heyder (Gesellschaft für Strahlen- und Umweltforschung mbH, Frankfurt am Main, West Germany). *Staub - Reinhaltung der Luft,* vol. 40, Jan. 1980, p. 9-13. 8 refs.

The paper reports on a study in which the total and regional mass deposition and mass deposition rate of hygroscopic atmospheric aerosol particles in the human respiratory tract was calculated for mouth- and nose-breathing. It is assumed that the particles immediately grow to their terminal size when entering the respiratory tract. Among the conclusions is that when the growth of atmospheric particles in the respiratory tract due to water vapor condensation on the particles is neglected, the total mass deposition in under- and alveolar mass deposition is overestimated. M.E.P.

A80-23975 **Effects of exercise training on left ventricular function in normal subjects - A longitudinal study by radionuclide angiography.** S. K. Rerych, P. M. Scholz, D. C. Sabiston, Jr., and R. H. Jones (Duke University, Medical Center, Durham, N.C.). *American Journal of Cardiology,* vol. 45, Feb. 1980, p. 244-252. 39 refs. Grant No. NIH-HL-17670-03.

The influence of physical training on the performance of the left cardiac ventricle in normal subjects is investigated by means of the noninvasive technique of radionuclide angiography. The left ventricular ejection fraction, left ventricular end-diastolic volume, pulmonary transit time, pulmonary blood volume and total body blood volume of 18 normal athletes were determined at rest and during exercise before and after a six-month period of intensive training for competitive swimming. Total body blood volume is found to increase after training, while cardiac output at rest remained similar despite a decrease in heart rate and ejection fraction and an increase in end-diastolic volume. During maximal exercise, the cardiac output is observed to have increased after training due to an increased

end-diastolic volume with a constant heart rate and ejection fraction. Individual variations are noted, and it is concluded that the increased cardiac output during maximal exercise results from the ability of the left ventricle to dilate from rest to exercise and to eject fully this further increase in end-diastolic volume at approximately the same heart rate. A.L.W.

A80-23993 # System design features of the Space Shuttle remote manipulator. P. Kumar, P. Truss, and C. G. Wagner-Bartak (Spar Aerospace, Ltd., Toronto, Canada). In: World Congress on the Theory of Machines and Mechanisms, 5th, Montreal, Canada, July 8-13, 1979, Proceedings. Volume 1. New York, American Society of Mechanical Engineers, 1979, p. 839-842. 7 refs.

The Space Shuttle Remote Manipulator (RMS) is an anthropomorphic, man-machine system primarily used for deploying and retrieving payloads (satellites, space modules) in orbit. The manipulator arm features a modularized design approach and the use of similar or common components. The data transfer between the various RMS interfaces is handled using a system of digital data busses. The system has been made 'instinctive' by the use of an appropriate control hierarchy which enables the astronaut/operator to simply move the manipulator end point without controlling the individual joints. Safety requirements have been met by incorporateing a back-up system to the principal control modes and a built-in scheme of fault detection and annunciation. The RMS is presently scheduled to be integrated into the orbital flight test program in 1979. (Author)

A80-23996 # Recursive solution to the equations of motion of an N-link manipulator. W. W. Armstrong (Montréal, Université, Montreal, Canada). In: World Congress on the Theory of Machines and Mechanisms, 5th, Montreal, Canada, July 8-13, 1979, Proceedings. Volume 2. New York, American Society of Mechanical Engineers, 1979, p. 1343-1346.

The equations of motion of a manipulator formed by a sequence of N rigid links, joined to each other and to a spacecraft or a terrestrial base by hinges which allow up to three rotational degrees of freedom, are solved by a recursive technique which does not involve operations on matrices larger than 3x3. This technique, which has also been generalized to the case of flexible links, has been programmed on a CYBER 173 computer for the development of the Shuttle Remote Manipulator System. (Author)

A80-24026 Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Edited by C. K. Bensel (U.S. Army, Clothing, Equipment and Materials Engineering Laboratory, Natick, Mass.). Santa Monica, Calif., Human Factors Society, Inc., 1979. 605 p. Members, $15.; nonmembers, $20.

The papers presented at this meeting cover such topics as models of muscle strength regulation, psychological and physiological reactions associated with repetitive tasks, computer systems, consumer products, environmental design, industrial economics, safety, both occupational and transportation, and training. V.P.

A80-24028 * Operator Station Design System - A computer aided design approach to work station layout. J. L. Lewis (NASA, Johnson Space Center, Houston, Tex.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 55-58.

The Operator Station Design System is resident in NASA's Johnson Space Center Spacecraft Design Division Performance Laboratory. It includes stand-alone minicomputer hardware and Panel Layout Automated Interactive Design and Crew Station Assessment of Reach software. The data base consists of the Shuttle Transportation System Orbiter Crew Compartment (in part), the Orbiter payload bay and remote manipulator (in part), and various anthropometric populations. The system is utilized to provide panel layouts, assess reach and vision, determine interference and fit problems early in the design phase, study design applications as a function of anthropometric and mission requirements, and to accomplish conceptual design to support advanced study efforts. (Author)

A80-24029 * Man-machine analysis of translation and work tasks of Skylab films. W. W. Hosler (General Dynamics Corp., Fort Worth, Tex.), J. G. Boelter (Texas, University, Odessa, Tex.), J. R. Morrow, Jr. (Houston, University, Houston, Tex.), and J. T. Jackson (NASA, Johnson Space Center, Spacecraft Design Div., Houston, Tex.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 59-62. Contract No. NAS9-15521.

An objective approach to determine the concurrent validity of computer-graphic models is real time film analysis. This technique was illustrated through the procedures and results obtained in an evaluation of translation of Skylab mission astronauts. The quantitative analysis was facilitated by the use of an electronic film analyzer, minicomputer, and specifically supportive software. The uses of this technique for human factors research are: (1) validation of theoretical operator models; (2) biokinetic analysis; (3) objective data evaluation; (4) dynamic anthropometry; (5) empirical time-line analysis; and (6) consideration of human variability. Computer assisted techniques for interface design and evaluation have the potential for improving the capability for human factors engineering. (Author)

A80-24031 * Development of display design and command usage guidelines for Spacelab experiment computer applications. D. W. Dodson and N. L. Shields, Jr. (Essex Corp., Huntsville, Ala.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings.
Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 70-74. 9 refs. Contract No. NAS8-32991.

Individual Spacelab experiments are responsible for developing their CRT display formats and interactive command scenarios for payload crew monitoring and control of experiment operations via the Spacelab Data Display System (DDS). In order to enhance crew training and flight operations, it was important to establish some standardization of the crew/experiment interface among different experiments by providing standard methods and techniques for data presentation and experiment commanding via the DDS. In order to establish optimum usage guidelines for the Spacelab DDS, the capabilities and limitations of the hardware and Experiment Computer Operating System design had to be considered. Since the operating system software and hardware design had already been established, the Display and Command Usage Guidelines were constrained to the capabilities of the existing system design. Empirical evaluations were conducted on a DDS simulator to determine optimum operator/system interface utilization of the system capabilities. Display parameters such as information location, display density, data organization, status presentation and dynamic update effects were evaluated in terms of response times and error rates. (Author)

A80-24032 The design and evaluation of complex systems - Application to a man-machine interface for aerial navigation. D. B. Beringer (Illinois, University, Urbana, Ill.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 75-79. 9 refs.

Systematic and economic design and evaluation strategies were applied to a computer-generated 4-D aerial navigation system. During the evaluation each of 24 experienced instrument pilots received training in a PLATO-based digital flight simulator using either a keyboard entry/static map, keyboard entry/dynamic map, or touch entry/dynamic map system. Tasks performed during the execution of an area navigation course included continuous flight control, navigation data updating, digital data entry, and amended course

plotting. Digital data entry training time was comparable for all three systems but the touch-map proved superior for the plotting tasks, greatly reducing training and task execution times while virtually eliminating errors. Subsequent performance evaluation showed that the touch-map reduced flight path tracking error, increased processing rates on a digit-cancelling secondary task, and increased the accuracy of manual plotting operations. It was concluded that a touch entry system could significantly reduce cockpit workload across a wide range of operational environments. (Author)

A80-24034 Effect of pretraining criterion on flight simulator and secondary cognitive task performance. M. Nataupsky, J. C. H. Schwank, E. B. Griggs, K. E. McKay, Jr., and S. D. Schmidt (U.S. Air Force Academy, Colorado Springs, Colo.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 305-309. 7 refs. Contract No. AMD/RDO-78-1.

Twenty-eight United States Air Force Academy cadets were trained in a GAT-1 flight simulator under one of four experimental groups. The groups were defined first by having heading information either provided by the normal heading indicator or by peripheral lights and second by their being trained on either a 5 deg or 10 deg heading deviation criterion. All cadets were subjected to four levels of a secondary cognitive task plus a control condition. There were no significant differences for either the main effect of heading indicator type or criterion level of training. The main effect of cognitive task difficulty level was significant for most measures. In addition, the heading indicator type by training criterion level interaction produced significant differences. Each significant interaction accounted for an average of 19% of the total variance. The study seems to indicate that training criteria are important independent variables in complex psychomotor/cognitive flight simulator tasks. (Author)

A80-24035 Development and application of a task taxonomy for tactical flying. R. P. Meyer, J. I. Laveson, G. L. Pape (Design Plus, St. Louis, Mo.), and B. J. Edwards (USAF, Human Resources Laboratory, Williams AFB, Ariz.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 315-319. Contract No. F33615-77-C-0020.

The data base for this taxonomy was obtained from the task analysis of sixteen basic fighter maneuvers. The next step was the development of nine classification rules designed to process these analyses into usable data for the taxonomic system. The taxonomic system allowed the task and skill information within the structure to be sorted, organized, and compared in a variety of combinations which can be useful to the training specialist. The taxonomic system thus permitted a number of applications. Basic skill comparisons were made across tasks and permitted the identification of skill criticality for specific training objectives. The frequency, complexity, and sequencing of specific skills required for various selected maneuvers were also compared and common elements identified. The system was also used to analyze the skills within a given group of tasks in order to design a single standard task which would contain a high percentage of skills identical to those of a given task group. (Author)

A80-24036 Validation of an in flight performance measurement methodology - F-4 ground attack training evaluation. B. J. Pierce, J. DeMaio (USAF, Human Resources Laboratory, Williams AFB, Ariz.), and D. Yates (USAF, Luke AFB, Ariz.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 320-323.

Validity and applicability were assessed for a performance measurement methodology developed to evaluate airborne performance on conventional weapon delivery maneuvers. The methodology provides an analysis of pilot performance using a stage-by-stage rating technique. Pilots assigned to an F-4 training squadron served as subjects. Results demonstrated that instructor pilot ratings of the individual stages of the delivery yield a reliable indicator of the quality of performance on that pass. The data address issues regarding which stages of the maneuver were most difficult, which improved most over training, and to what extent this improvement affected performance on the entire delivery. (Author)

A80-24037 Air combat maneuvering performance measurement. M. J. Kelly, J. C. Reed (USAF, Human Resources Laboratory, Williams AFB, Ariz.), A. L. Wooldridge, and R. T. Hennessy. In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 324-328.

Due to the complex, dynamic and fast-moving nature of the air combat task, performance assessment during air-to-air combat provides many unique measurement problems. A combined analytical and empirical technical approach was used to develop a candidate measurement structure and algorithm for the measurement of pilot performance during one-versus-one air combat maneuvering. Nearly all of 28 candidate measures were found to discriminate between high and low skilled pilots during free engagements on the Simulator for Air-to-Air Combat. Discriminant analyses provided a measurement algorithm consisting of 13 measures which accounted for 51% of the variance in the performance data and which predicted membership in high or low skill groups with 92% accuracy. (Author)

A80-24038 The development of objective inflight performance assessment procedures. J. M. Childs (Canyon Research Group, Inc., Fort Rucker, Ala.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 329-333. 5 refs.

The purpose of this research was to develop procedures for objectively evaluating Initial Entry Rotary Wing (IERW) student performance in flight. Maneuvers of the Basic Instrument phase were addressed. Descriptive inflight scoring procedures to assess absolute deviations of desired values from observed values at designated times, were developed. Desired values were determined on the basis of the rates specified in IERW training guides. Observed values were instrument indications of airspeed, altitude, or heating at those times. Four tolerance categories were incorporated into alternative six-point maneuver scoring algorithms designed to assess aircraft control precision. The criterion for acceptable proficiency was the maintenance of each sampled measure within standard IERW tolerance limits for each sampling point of a maneuver. Tests of the objective scoring procedures were conducted in the UH-1 flight simulator. (Author)

A80-24039 Actual vs simulated equipment for aircraft maintenance training - Cost implications of the incremental vs the unique device. R. E. Vesterwig and F. T. Eggemeier (USAF, Human Resources Laboratory, Wright-Patterson AFB, Ohio). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 334-338. 9 refs.

Life cycle cost estimates were developed for use of simulated test equipment vs actual test equipment in a maintenance training program of the type used for current advanced fighter aircraft. Previous lift cycle cost comparisons had not explicitly considered the cost implications of procurement and support of a unique training device vs an incremental device. This effort included the unique vs the incremental device factor. Total estimated fifteen year costs for simulated equipment trainers were significantly lower than comparable estimates for actual equipment trainers. The results indicate that the cost implications of a unique device vs an incremental device are important determinants of both acquisition and support cost estimates and should be considered fully in future life cycle costing efforts. (Author)

A80-24040 The effect of image quality on search for static and dynamic targets - MTFA-performance correlations. J. C. Gutmann, H. L. Snyder, W. W. Farley, and J. E. Evans, III (Virginia Polytechnic Institute and State University, Blacksburg, Va.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings.
Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 339-343. 6 refs.

This report contains the results of two experiments which investigated the effects of the quality of a televised image on eye movements and search-related measures. The first experimental search task involved having subjects perform an air-to-ground search during a simulated flight. The quality of the image presented was varied by either passing, low-pass filtering, or attenuating the video signal and by adding electrical white noise to the video signal. Low to moderate correlations between modulation transfer function area (MTFA) and performance measures generally indicated that as MTFA increases performance improves and fixation durations decrease. The search task of the second experiment consisted of having the subjects search for a designated letter or numeral across a televised picture of randomly positioned letters and numerals. The quality of the picture was varied by either passing, low-pass filtering, high-pass filtering, or attenuating the video signal and by adding electrical white noise to the video signal. Correlations between MTFA and performance measures indicated that increases in MTFA lead to decreases in search time and decreases in fixation duration. (Author)

A80-24041 Operator visual workload shifts as a function of vehicle stability. R. R. Simmons and K. A. Kimball (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, Ala.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 352-356.

This research was initiated to compare the visual performance/workload of pilots during fixed wing and rotary wing flights. The corneal reflection technique was used to obtain the visual data. The results demonstrate that visual performance/workload of the pilots was different for each aircraft. Because the major difference between the aircraft was the aerodynamic stability, it was assumed that the visual workload was in fact a function of aircraft stability. The overall purpose of such research has been to provide information concerning pilots' visual requirements for safe mission accomplishment. (Author)

A80-24042 * Evaluation of a pilot workload metric for simulated VTOL landing tasks. R. A. North and K. Graffunder (Honeywell Systems and Research Center, Minneapolis, Minn.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings.
Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 357-361. Contract No. NAS1-15081.

A methodological approach to measuring workload was investigated for evaluation of new concepts in VTOL aircraft displays. Multivariate discriminant functions were formed from conventional flight performance and/or visual response variables to maximize detection of experimental differences. The flight performance variable discriminant showed maximum differentiation between crosswind conditions. The visual response measure discriminant maximized differences between fixed vs. motion base conditions and experimental displays. Physiological variables were used to attempt to predict the discriminant function values for each subject/condition/trial. The weights of the physiological variables in these equations showed agreement with previous studies. High muscle tension, light but irregular breathing patterns, and higher heart rate with low amplitude all produced higher scores on this scale and thus, represented higher workload levels. (Author)

A80-24043 A review of literature relating to visual fatigue. W. J. Smith (IBM Human Factors Center, San Jose, Calif.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings.
Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 362-366. 39 refs.

The design of workstations with visual displays has become the subject of considerable interest and concern during the past few years. One area of concern relates to the assumption that long term viewing of such displays at close focal distances may contribute to visual fatigue. A second is the effect on the human visual system of the frequent changes in surface illumination associated with display units used in combination with hard copy documents. As a consequence of these and other concerns, the popular press has published articles that have aroused the interest of various scientific organizations regarding the subject of these effects. This paper discusses a review of some of the literature regarding a limited aspect of this issue, namely the accommodation and pupillary systems as they relate to long term viewing of visual display units. (Author)

A80-24044 Visual search and color coding. R. C. Carter, Jr. (Pennsylvania State University, University Park, Pa.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 369-373. 10 refs.

Several experiments were conducted to investigate the effects on search time of display and personnel characteristics. Search time increased by an order of magnitude when the number of display items of the target's color increased from one to the display density. Items not of the target's color affected search time to the extent that their color was similar to that of the target. The similarity of the colors was found to be well represented by a color difference calculation. The distribution on the display of target-colored items also affected search time. Personnel characteristics, including several measures of ability and experience, were unrelated to search speed. (Author)

A80-24045 The use of color-coded symbols in a highly dense situation display. C. J. Kopala (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 397-401. 11 refs.

The effectiveness of redundant color-coding for displays used by highly-loaded operators performing a series of complex tasks has never been clearly demonstrated. Pilot flight performance and threat recognition performance using two coding conditions for a threat display were compared in a simulated mission. One coding condition consisted of shape-coded symbols, the other of symbols that were both color- and shape-coded. Redundant color-coding was found to significantly reduce both response time and error rate. (Author)

A80-24046 Peripheral vision and tracking performance under stress. J. M. Bermudez, D. A. Harris, and J. C. H. Schwank. In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings.
Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 402-406. 7 refs. Contract No. AMD/RDO-78-1.

The complexity of modern aircraft systems places substantial information processing loads on the pilot, which are excerbated during emergency landings and other high-stress situations. Psychological and behavioral evidence for two human visual systems that may differ in susceptibility to psychological stress suggests the possibility of a natural stress-resistant information channel that could be used for information input during high-stress situations. It follows that the extreme peripheral visual fields could be a possible location for adjunct visual displays intended to orient the pilot's focal vision and attention to critical instrument displays during emergency situations. In the present paper, data are examined concerning the effects of three types of instrument display, used under varying levels of stress during a simulated instrument landing. Focal viewing was found to be more sensitive to information about pitch, whereas peripheral viewing was more sensitive to information about roll. V.P.

A80-24047 Perturbation of induced rotation as an index of pattern structure. F. Ward, T. Dingus, J. Dingus, R. Jones, and G. Palmer (Wright State University, Dayton, Ohio). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 407-410. 9 refs.

The paper deals with a methodology where the smoothness of induced rotation is used to quantify the organizational structure of geometric figures. Tests with human subjects showed that the amount of texturing has a strong effect on perceived rotation. For all presentation times, an increase in texture density produced a decrease in the threshold to detect perturbation of rotation for the planar rotation condition. For depth rotation, presentation times of 80 and 100 msec revealed the same effect. V.P.

A80-24048 Prediction and quickening in perspective flight displays for curved landing approaches. R. S. Jensen (Illinois, University, Champaign, Ill.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 498-502. 8 refs.

In an empirical test of various predictor and quickened display algorithms eighteen professional pilot-subjects made four curved-path landing approaches in a Gat-2 simulator using each of 14 dynamically different display configurations in a within-subject design. Results indicate that second- and third-order predictor displays provide the best lateral performance. Intermediate levels of prediction and quickening provide best vertical control. Predictor-quickening algorithms of increasing computational order significantly reduce aileron, rudder, and elevator control responses, reflecting successive reductions in cockpit workload. Whereas conventional crosspointer displays are not adequate for curved landing approaches, perspective displays with predictors and some vertical dimension quickening are highly effective. (Author)

A80-24049 Utilization of energy maneuverability data in improving in-flight performance and performance in air combat maneuvering. W. F. Moroney (U.S. Naval Postgraduate School, Monterey, Calif.), R. Pruitt (McDonnell Aircraft Co., St. Louis, Mo.), and C. Lau (U.S. Navy, Pacific Missile Test Center, Point Mugu, Calif.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 503-507.

Energy maneuverability (EM) has been defined as the ability to perform a change, or a combination of changes, in direction, altitude, and airspeed expressed in terms of energy and energy rate. In the present paper, two situations are described in which EM data were presented to pilots in an analog format on a helmet-mounted display in an effort to improve their ability to maximize the performance of their aircraft. From the tests, this new format may be expected to provide a better means for pilots to determine how well they have maximized aircraft performance. V.P.

A80-24050 Data analysis methodology for day/night inflight tactical navigation. E. M. Connelly, R. F. Comeau (Performance Measurement Associates, Inc., Vienna, Va.), G. L. Holman, and J. A. Bynum (U.S. Army, Army Research Institute, Fort Rucker, Ala.). In: Human Factors Society, Annual Meeting, 23rd, Boston, Mass., October 29-November 1, 1979, Proceedings. Santa Monica, Calif., Human Factors Society, Inc., 1979, p. 563-567. Grant No. DAHC19-77-C-0042.

Nap-of-the-earth helicopter navigation, both at night and during the day, is essential to the Army's mission. Navigation performance, defined as the probability of navigating along a prescribed route or route segment without deviation, is a function of many factors including map and terrain types. Determination of the effects of these factors is important information for predicting performance of Army navigators, identifying factors critical to navigation, evaluating the probability of navigation success along a route and developing training aids. The purpose of the research work reported here was to analyze NOE flight experiment data to develop that information. This paper contains results from analyses of helicopter NOE navigation data to determine the probability of navigation success along a route as a function of terrain type, to develop a means of determining route difficulty, and to develop a method of scoring student performance. (Author)

A80-24135 Vector model for normal and dichromatic color vision. S. L. Guth, T. Benzschawel (Indiana University, Bloomington, Ind.), and R. W. Massof (Johns Hopkins University, Baltimore, Md.). *Optical Society of America, Journal,* vol. 70, Feb. 1980, p. 197-212. 46 refs. NSF Grants No. GB-40516; No. BNS-77-17299.

The inclusion of cone mechanisms in a slightly revised version of an earlier model allows accounts of phenomena that involve receptor effects as well as dichromatic color vision. Intensity-dependent parameters that simulate the adaptation of receptors and opponent and nonopponent mechanisms are varied to predict a wide range of data for both normals and dichromats, including: (1) color matching; (2) the approximate apparent hue and saturation of the spectrum; (3) foveal spectral sensitivities obtained by flicker photometry and by detection in the dark and under conditions of achromatic or chromatic adaptation; (4) heterochromatic additivity failures in the dark-adapted and chromatically adapted eye; (5) approximate differences between brightness and luminance; and, (6) color and wavelength discrimination under varying adaptation conditions. (Author)

A80-24136 Large color differences and the geometry of Munsell color space. E. W. Farmer, R. M. Taylor, and A. J. Belyavin (RAF, Institute of Aviation Medicine, Farnborough, Hants, England). *Optical Society of America, Journal,* vol. 70, Feb. 1980, p. 243-245. 16 refs.

In the Munsell system, colors are rperesented as points, and color differences as the distances between points in a cylindrical space defined by a vertical axis of value (lightness) and radial and circular axes of chroma (saturation) and hue, respectively. The paper describes an experiment conducted to examine the psychological validity of this scheme and of the assumption that color space conforms to Euclidean geometry. Multidimensional scaling was applied to a set of colors, encompassing a wide range of variations in all three Munsell attributes. Twenty subjects judged the similarity of 153 color pairs, and subjective estimates were pooled to produce a single value for each color pair. The total negative variance was only 1.9% of the total positive variance, and the obtained three-dimensional configuration concurred with the postulated organization of Munsell color space. It was concluded that meaningful subjective estimates of color similarity can be obtained for samples widely separated in color space. However, it is noted that a weighting constant has to be introduced to control step-size inequality between attributes; the ratio of step sizes along the value and chroma axes was calculated to be 1:3.76. L.M.

A80-24222 * Growth hormone control of glucose oxidation pathways in hypophysectomized rats. D. D. Feller, E. D. Neville, L. C. Keil, and S. Ellis (NASA, Ames Research Center, Moffett Field, Calif.). *Physiological Chemistry and Physics,* vol. 11, no. 3, 1979, p. 205-215. 12 refs.

A80-24265 * Optimal estimator model for human spatial orientation. J. Borah (G & W Applied Science Laboratories, Waltham, Mass.), L. R. Young (MIT, Cambridge, Mass.), and R. E. Curry (NASA, Ames Research Center, Moffett Field, Calif.). In: Joint Automatic Control Conference, Denver, Colo., June 17-21, 1979, Proceedings. New York, American Institute of Chemical Engineers, 1979, p. 800-805. 17 refs. Contract No. F33615-76-C-0039.

A model is being developed to predict pilot dynamic spatial orientation in response to multisensory stimuli. Motion stimuli are first processed by dynamic models of the visual, vestibular, tactile,

and proprioceptive sensors. Central nervous system function is then modeled as a steady-state Kalman filter which blends information from the various sensors to form an estimate of spatial orientation. Where necessary, this linear central estimator has been augmented with nonlinear elements to reflect more accurately some highly nonlinear human response characteristics. Computer implementation of the model has shown agreement with several important qualitative characteristics of human spatial orientation, and it is felt that with further modification and additional experimental data the model can be improved and extended. Possible means are described for extending the model to better represent the active pilot with varying skill and work load levels. (Author)

A80-24347 Cardiograms: Theory and applications. Edited by D. N. Ghista, E. Van Vollenhoven (Delft, Technische Hogeschool, Delft, Netherlands), W.-J. Yang, and H. Reul. Basel, S. Karger AG (Advances in Cardiovascular Physics. Volume 2), 1979. 168 p. $58.75.

The work focuses on the theory and application of magnetocardiography, phonocardiography and its instrumentation, and ballistocardiography. The electrocardiogram and magnetocardiogram are discussed along with the electric and magnetic heart vectors, the vector magnetocardiography instrumentation, and its clinical applications; phonocardiography, the nature of cardiovascular sound, the phonocardiograph, the different types of microphones, and the use of spectral phonocardiography are described; finally, the principles, simulation, and applications of ballistocardiography are analyzed together with its analog and digital models. A.T.

A80-24348 The theory and application of magnetocardiography. J. P. Wikswo, Jr., J. A. V. Malmivuo, W. H. Barry, M. C. Leifer, and W. M. Fairbank (Stanford University, Stanford, Calif.). In: Cardiograms: Theory and applications. Basel, S. Karger AG, 1979, p. 1-67. 85 refs. NSF Grant No. APR-72-03447-A04.

The similarities and differences between the electrocardiogram and magnetocardiogram which are recordings of the electric and magnetic fields associated with cardiac electrical activity are discussed. The information content of the two signals is assessed using the electric and magnetic heart vectors, showing that more information regarding the cardiac current source distribution can be obtained from measurement of these vectors than from either measurement alone. It is concluded that magnetocardiography can be a valuable addition to the existing clinical techniques. A.T.

A80-24349 Phonocardiography - Analyses of instrumentation, and vibration of heart structures to determine their constitutive properties. E. Van Vollenhoven, N. Suzumura, D. N. Ghista, J. Mazumdar, and T. Hearn (Delft, Technische Hogeschool, Delft, Netherlands; Nagoya Institute of Technology, Nagoya, Japan; U.S. Veterans Administration Hospital, Palo Alto, Calif.; Adelaide, University, Adelaide, Australia). In: Cardiograms: Theory and applications. Basel, S. Karger AG, 1979, p. 68-118. 59 refs.

The paper presents guidelines for standardization of phonocardiography which provides a record of the vibrations of the chest wall originating from the heart. It provides (1) the theory of contact and air microphones, (2) experimental methods of their calibration, and (3) mathematical models of vibrations of cardiac structures. For the overall frequency response of the phonocardiograph, the microphone frequency from the chest wall is combined with the frequency responses of filters and the recording unit to enable determination of the normal-pathological ranges of their constitutive properties. Finally, the constitutive properties of the left ventricular chamber and the mitral valve leaflet are derived in terms of their size parameters. A.T.

A80-24350 Ballistocardiography - Principles, simulation, applications. I. Tomek (Acadia University, Wolfville, Nova Scotia, Canada). In: Cardiograms: Theory and applications. Basel, S. Karger AG, 1979, p. 119-157. 32 refs.

The principle and applications of the ballistocardiogram (BCG) and of the air-supported equipment for its recording are described. A discussion of a time domain electrical analog of the blood circulation capable of BCG simulation is followed by a presentation of a frequency domain digital model of the same system. An analytical model is constructed which considers the effects of heart motion, varying blood volumes in the heart chambers, and the reaction forces due to the surrounding tissues. Finally, BCG applications are discussed and compared with other techniques. A.T.

A80-24492 * Thermal history, chemical composition and relationship of comets to the origin of life. W. M. Irvine (Massachusetts, University, Amherst, Mass.; Onsala Space Observatory, Goteborg, Sweden), S. B. Leschine, and F. P. Schloerb (Massachusetts, University, Amherst, Mass.). *Nature,* vol. 283, Feb. 21, 1980, p. 748, 749. 47 refs. Grant No. NGL-22-010-023.

The role of thermal processes in determining the chemical composition of comets is considered, and implications of possible cometary constituents for the origin and evolution of life on earth are discussed. It is shown that the inclusion of short-lived Al-26 from a nearby supernova explosion into cometary nuclei could lead to comets with surfaces cool enough to retain H_2O and interiors warm enough for thermal processing to occur, with the production of complex organic molecules such as amino acids and nucleic acid bases. It is thus suggested that comets may have played a part in seeding the primitive earth with biological polymers capable of self-replication or of evolving towards that capability, and may even be responsible for the subsequent introduction of organic material capable of infecting already existing cells. A.L.W.

A80-24525 Aviation medicine. Volume 1 - Physiology and human factors. Edited by G. Dhenin (RAF, London, England). London, Tri-Med Books, Ltd., 1978. 790 p. $41.40.

The book discusses the physiological and psychological aspects of human responses to flight stresses and the principles used in the protection of man from the hostile environment of flight. Consideration is given to changes of pressure, long- and short-duration acceleration including vibration and temperature extremes encountered in flying. The effects of each stress on normal performance, human tolerances to each stress and the physiological and psychological procedures used to minimize the impairment of performance due to each stress are presented. The effects of flight on vision, hearing and spatial orientation are also discussed, and the effects of irregular sleep and work schedules are considered. The psychology of flight tasks and training is also examined, and the medical aspects of helicopter, VTOL and SST flight and manned space flight are indicated. A.L.W.

STAR ENTRIES

N80-16216*# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.
WHOLE-BODY VIBRATION OF HEAVY EQUIPMENT OPERATORS
D. E. Wasserman, W. C. Asburry, and T. E. Doyle *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 47-68 refs

Avail: NTIS HC A10/MF A01 CSCL 05H

A vibration field study was made of workers operating track-type tractors, scrapers, motor graders, loaders, backhoes, compactors, skidders, and dump trucks. Vibration data were obtained from the vehicle floor and manseat interface, as well as from the operator's knee, shoulder, and head. The vibration spectrum analysis indicates that for the different types of machines little difference could be attributed to the experience or body mass of the operator and that most of the higher level vibration occurred below the 4 to 8 Hz human body resonance band, much of it at less than 1 Hz. K.L.

N80-16217*# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
RESEARCH RELATED TO THE EXPANSION AND IMPROVEMENT OF HUMAN VIBRATION EXPOSURE CRITERIA

Richard W. Shoenberger *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 69-79 refs

Avail: NTIS HC A10/MF A01 CSCL 05H

A psychophysical matching technique was used to investigate the perceived intensity of various types of vibration environments. Comparisons of sinusoidal and nonsinusoidal vibrations as well as comparisons of translational and angular vibrations were conducted. Results discriminate between alternate methods for evaluating the severity of nonsinusoidal vibrations and indicate relationships between translational and angular vibrations needed for the expansion of vibration criteria to include angular motions. K.L.

N80-16714* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD AND APPARATUS FOR ELIMINATING LUMINOL INTERFERENCE MATERIAL Patent
Eldon L. Jeffers (Boeing Aerospace Co., Houston, Tex.) and Richard R. Thomas, inventors (to NASA) (Boeing Aerospace Co., Houston, Tex.) Issued 27 Nov. 1979 10 p Filed 9 Feb. 1978 Supersedes N78-18674 (16 - 09, p 1197) Sponsored by NASA (NASA-Case-MSC-16260-1; US-Patent-4,176,007; US-Patent-Appl-SN-876440; US-Patent-Class-435-34; US-Patent-Class-422-52; US-Patent-Class-23-927) Avail: US Patent and Trademark Office CSCL 06A

A method and apparatus for removing porphyrins from a fluid sample which are unrelated to the number of bacteria present in the sample and prior to combining the sample with luminol reagent to produce a light reaction is disclosed. The method involves a pre-incubation of the sample with a dilute concentration of hydrogen peroxide which inactivates the interfering soluble porphyrins. Further, by delaying taking a light measurement for a predetermined time period after combining the hydrogen peroxide-treated water sample with a luminol reagent, the luminescence produced by the reaction of the luminol reagent with ions present in the solution, being short lived, will have died out so that only porphyrins within the bacteria which have been released by rupturing the cells with the sodium hydroxide in the luminol reagent, will be measured. The measurement thus obtained can then be related to the concentration of live and dead bacteria in the fluid sample.
Official Gazette of the U.S. Patent and Trademark Office

N80-16715* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD FOR SEPARATING BIOLOGICAL CELLS Patent
Donald E. Brooks, inventor (to NASA) (Oregon Univ., Portland) Issued 1 Jan. 1980 5 p Filed 6 Mar. 1979 Supersedes N79-21743 (17 - 12 p 1616) Sponsored by NASA (NASA-Case-MFS-23883-1; US-Patent-4,181,589; US-Patent-Appl-SN-017888; US-Patent-Class-204-180R; US-Patent-Class-204-299R; US-Patent-Class-424-12) Avail: US Patent and Trademark Office CSCL 06A

A method for separating biological cells by suspending a mixed cell population in a two-phase polymer system is described. The polymer system consists of droplet phases with different surface potentials for which the cell populations exhibit different affinities. The system is subjected to an electrostatic field of sufficient intensity to cause migration of the droplets with an attendant separation of cells.
Official Gazette of the U.S. Patent and Trademark Office

N80-16716 Michigan State Univ., East Lansing.
FACTORS INFLUENCING SPECIFIC GROWTH RATES AND SEASONAL ABUNDANCE OF EUTROPHIC LAKE PHYTOPLANKTON Ph.D. Thesis
Gary Frank Marx 1979 94 p
Avail: Univ. Microfilms Order No. 8001561

The seasonal succession of dominant phytoplankton populations and the daily concentrations of major nutrients in a central Michigan waste treatment basin were monitored over the 1977 growing season in order to study the factors controlling the growth of the various species. Carbon and light attenuation due to large algal standing crops, as well as the availability of dissolved organic substances, seemed to be the major factors controlling annual algal productivity. While a simple, kinetics based model was not be able to accurately predict the weekly specific growth rates of the various species, predictions of approximate periods of growth were quite accurate, making such a model of considerable value for practical use. Dissert. Abstr.

N80-16717 California Univ., Berkeley.
THEORETICAL STUDIES OF THE LIGHT REACTIONS IN PHOTOSYNTHESIS Ph.D. Thesis
Richard Adam Friesner 1979 193 p
Avail: Univ. Microfilms Order No. 8000347

Using magnetic resonance formalism and theoretical formulations to interpret electron paramagnetic resonance (EPR) spectra the light reactions of photosynthesis were studied. A general method of determining the orientational distribution function of a partially ordered ensemble of paramagnetic systems from its EPR lineshape is presented. A radical pair theory of spin polarization for systems of membrane bound radicals with anisotropic g tensors is developed, and used to explain the orientation dependence of the lineshape of the polarized signal. The electron transport cofactors involved in the photosynthetic light reactions in both green plants and photosynthetic bacteria are identified. Dissert. Abstr.

N80-16718*# National Aeronautics and Space Administration, Washington, D. C.
GLUCOSE METABOLISM IN DIFFERENT REGIONS OF THE RAT BRAIN UNDER HYPOKINETIC STRESS INFLUENCE
K. Konitzer (Acad. of Sci. of the Ger. Democratic Republic) and S. Voigt (Acad. of Sci. of the Ger. Democratic Republic) Jan. 1980 15 p refs Transl. into ENGLISH from Acta Biol. Med. Ger. (East Germany), v. 35, 1976 p 853-866 Transl. by Kanner (Leo) Associates, Redwood City, California (NASA-TM-75949) Avail: NTIS HC A02/MF A01 CSCL 06C

Glucose metabolism in rats kept under long term hypokinetic stress was studied in 7 brain regions. Determination was made

of the regional levels of glucose, lactate, glutamate, glutamine, aspartate, gamma-aminobutyrate and the incorporation of C-14 from plasma glucose into these metabolites, in glycogen and protein. From the content and activity data the regional glucose flux was approximated quantitatively. Under normal conditions the activity gradient cortex and frontal pole cerebellum, thalamus and mesencephalon, hypothalamus and pons and medulla is identical with that of the regional blood supply (measured with I131 serum albumin as the blood marker). Within the first days of immobilization a functional hypoxia occurred in all brain regions and the utilization of cycle amino acids for protein synthesis was strongly diminished. After the first week of stress the capillary volumes of all regions increased, aerobic glucose metabolism was enhanced (factors 1.3 - 2.0) and the incorporation of glucose C-14 via cycle amino acids into protein was considerably potentiated. The metabolic parameters normalized between the 7th and 11th week of stress. Blood supply and metabolic rate increased most in the hypothalamus. R.C.T.

N80-16719*# National Aeronautics and Space Administration, Washington, D. C.

MORPHOLOGICAL AND FUNCTIONAL MANIFESTATIONS OF RAT ADRENAL-CORTEX RESPONSE TO SODIUM BROMIDE ADMINISTRATION UNDER HYPODYNAMIC STRESS

L. T. Kirichek (Kharkov Med. Inst.) and V. I. Zholudeva (Kharkov Med. Inst.) Nov. 1979 12 p refs Transl. into ENGLISH from Farmakol. Toksikol. (USSR), v. 38, no. 6, Nov. - Dec. 1975 p 703-706 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-7593) Avail: NTIS HC A02/MF A01 CSCL 05C

Functional and morphological manifestations of adrenal cortex response to hypodynamia (2-hr immobilization on an operating table) under the influence of bromine preparations were studied. The sodium bromide was administered intraperitoneally in 100, 250, and 500 mg/kg doses once and repeatedly during ten days. The adrenal gland was evaluated functionally by ascorbic acid and cholesterol content and morphologically by coloring it with hematoxylin-eosin and Sudans for lipid revealing at freezing. Results are displayed in two tables and microphotographs. They are summarized as follows: the bromine weakens the functional state of the adrenal cortex in intact rats, causing changes similar to those under stress. During immobilization combined with preliminary bromine administration, a less pronounced stress reaction is noticeable. R.C.T.

N80-16720*# National Aeronautics and Space Administration, Washington, D. C.

CATECHOLAMINES AND MYOCARDIAL CONTRACTILE FUNCTION DURING HYPODYNAMIA AND WITH AN ALTERED THYROID HORMONE BALANCE

G. M. Pruss, V. I. Kuznetsov, and A. A. Zhilinskaya Jan. 1980 17 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biolhk. (USSR), no. 2, 1975, p 187-195 Original language document previously announced as A75-32600 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Vitebsk State Medical Inst. (USSR)

(Contract NASw-3199)

(NASA-TM-76000) Avail: NTIS HC A02/MF A01 CSCL 06C

The dynamics of catecholamine content and myocardial contractile function during hypodynamia were studied in 109 white rats whose motor activity was severely restricted for up to 30 days. During the first five days myocardial catecholamine content, contractile function, and physical load tolerance decreased. Small doses of thyroidin counteracted this tendency. After 15 days, noradrenalin content and other indices approached normal levels and, after 30 days, were the same as control levels, although cardiac functional reserve was decreased. Thyroidin administration after 15 days had no noticeable effect. A detailed table shows changes in 17 indices of myocardial contractile function during hypodynamia. K.L.

N80-16721# Louisiana State Univ. and A&M Coll., Baton Rouge. Dept. of Chemistry.

PHYSIO-CHEMICAL INVESTIGATION OF SOME AREAS OF FUNDAMENTAL SIGNIFICANCE TO BIOPHYSICS Annual Report, 1978 - 1979

S. P. McGlynn 7 Aug. 1979 151 p refs

(Contract EY-76-S-05-3018)

(ORO-3018-T1) Avail: NTIS HC A08/MF A01

Biographic titles and descriptions of graduate and postgraduate research efforts for the period 1978-1979 are presented. Work in progress includes analyzing the lowest-energy Rydberg transitions of the alkyl halides; decomposition of a spectroscopic signal S into a system of bands; luminescence of aqueous systems; a study of the effects of small molecules on hydrogen bonding via glass transitions in ethanol; Rydberg/intravalence mixing in the S2 state of azulene; ultraviolet photoelectron spectroscopy of carbonyls; and multi-photon processes. R.E.S.

N80-16722# Rochester Univ., N. Y. Dept. of Radiation Biology and Biophysics.

INFLUENCE OF X IRRADIATION AND DIET ON PITUITARY/THYROID FUNCTION IN THE RAT M.S. Thesis

I. G. Qassar 1979 59 p refs

(Contract EY-76-C-02-3490)

(UR-3490-1674) Avail: NTIS HC A04/MF A01

Rats were maintained on low iodine diet or treated with T sub 4. A significant increase in thyroid weight was observed in rats on low iodine diet whereas among rats on normal diet with thyroxine injections, the thyroid was lower in weight than thyroids of control animals. Pituitary weight increased significantly in rats on low iodine diet or T sub 4 treatment. Where PTU was administered to rats pretreated with either normal diet, normal diet plus T sub 4, or maintained on low iodine diet and then exposed to radiation (100 to 400R) to the neck, it was not possible to distinguish the effect of such local radiation on body growth. Contrary to low iodine treatment, administration of PTU did not result in any increase in pituitary weight in rats maintained on normal diet prior to radiation or in rats maintained on low iodine diet prior to radiation. There was, however, a significant increase in pituitary weight in rats injected with thyroxine prior to radiation (250R or 400R). DOE

N80-16723# Iowa Univ., Iowa City.

ANAEROBIC BIOLOGICAL TREATMENT OF LIQUID WASTES FROM PYROLYSIS PROCESSES Progress Report, 1 Apr. 1977 - 31 Mar. 1979

R. R. Dague 15 May 1979 61 p

(Contract EC-77-S-02-4455)

(COO-4455-2) Avail: NTIS HC A04/MF A01

Experimental work has shown that gas scrubber wastes from the pyrolysis process are high in organics that are toxic to anaerobic biological treatment systems. Carbon was evaluated as a method of pretreatment, co-treatment, or separate treatment for application to the pyrolysis wastes. Experiments with carbon adsorption indicates that wastes can be adsorbed to a high degree. Isotherms indicate an adsorptive capacity of between 0.60 and 0.86 grams of COD per gram of carbon. Suspended growth systems are also discussed. DOE

N80-16725* National Aeronautics and Space Administration. Pasadena Office, Calif.

APPARATUS FOR ENDOSCOPIC EXAMINATION Patent

Robert E. Frazer, inventor (to NASA) Issued 4 Dec. 1979 10 p Filed 17 Jun. 1977 Supersedes N79-19678 (17 - 10, p 1328)

(NASA-Case-NPO-14092-1; US-Patent-4,176,662; US-Patent-Appl-SN-807597; US-Patent-Class-128-6; US-Patent-Class-128-348; US-Patent-Class-128-DIG9; US-Patent-Class-138-33; US-Patent-Class-138-103; US-Patent-Class-138-133; US-Patent-Class-219-201; US-Patent-Class-219-522) Avail: US Patent and Trademark Office CSCL 06B

An endoscope is having a propulsion mechanism and at least one transmitter at the distal end transmitting bursts of energy waves (radio frequency or ultrasonic) for tracking the position of the distal end through the use of two or more transducers on the anterior or lateral surfaces of a patient is described. The propulsion mechanism which consists of two radially expandable bladders separated by an axially expandable

bellows with only the forward bladder attached to the distal end is discussed. Alternate mechanisms are reported. A sheath on the endoscope which includes material having a sharp melting point slightly above body temperature so that the sheath is made flexible at selected sections by applying current to separate heating wires in the sections of the sheath is described.
Official Gazette of the U.S. Patent and Trademark Office

N80-16726*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF GRAVITATION STRESS AND HYPOKINESIA ON BLOOD VESSELS OF THE TESTICLE
E. F. Palazhchenko (I. P. Pavlov First Leningrad Med. Inst.) Nov. 1979 14 p refs Transl. into ENGLISH from Arkh. Anat. Gistol. Embriol. (USSR), v. 64, no. 5, 1973 p 57-63 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75942) Avail: NTIS HC A02/MF A01 CSCL 06S

Rabbits were exposed to single maximum endurable stresses of cranio-caudal direction, hypokinesia for periods of one to eight weeks, and hypokinesia followed by gravitation stresses. The stresses caused dilatation of vessels, greater sinuosity, and occasional ruptures of the walls and extravasation. The greater part of the capillaries were dilated; the greatest part constricted. In hypokinesia there was an increasing atrophy of the testes. Significant results are reported. R.C.T.

N80-16727*# National Aeronautics and Space Administration, Washington, D. C.
THE SIGNIFICANCE OF ACTH FOR THE PROCESS OF FORMATION OF COMPLEX HEPARIN COMPOUNDS IN THE BLOOD DURING IMMOBILIZATION STRESS
B. A. Kudryashov (Moscow State Univ.), F. B. Shapiro (Moscow State Univ.), F. B. Lomovskaya (Moscow State Univ.), and L. A. Lyapina (Moscow State Univ.) Nov. 1979 14 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 61, no. 2, 1975 p 244-250 Original language document was announced as A75-31019 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75946) Avail: NTIS HC A02/MF A01 CSCL 06S

Adrenocorticotropin (ACTH) was administered to rats at different times following adrenalectomy. Adrenocorticotropin caused a significant increase in the formation of heparin complexes even in the absence of stress factor. When ACTH secretion is blocked, immobilization stress is not accompanied by an increase in the process of complex formation. The effect of ACTH on the formation of heparin complexes was mediated through its stimulation of the adrenal cortex. R.C.T.

N80-16728*# National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF INGESTION OF COLD AND HOT WATER ON THE COURSE OF THERMAL CHANGES IN THE STOMACH AND INTESTINE
Ye. L. Batinkov Sep. 1979 12 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 27, no. 1, 1939 p 108-114 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. Prep. by First Med. Clinic, Crimean Med. Inst. Imenistalin (USSR)
(NASw-3199)
(NASA-TM-75515) Avail: NTIS HC A02/MF A01 CSCL 06P

With the use of a thermocouple and mirror galvanometer, calibrated before the experiment and after each test, it was found that the normal temperature in the esophagus is 0.1-0.4 C higher than in the oral cavity, the temperature in the duodenum is somewhat less than in the stomach, but higher with cholecystitis, duodenitis or gastritis, the temperature in the normal stomach equals or is somewhat higher than in the esophagus, and that the temperature of distended stomachs frequently is lower than in the esophagus. It was found that hot water is retained in the stomach longer than cold water, and that both hot and cold water are allowed to pass into the duodenum when the water temperature becomes approximately equal to that of the surrounding organs. Author

N80-16729# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.
EMPIRICAL BAYES ESTIMATION OF CRITICAL DOSAGES HAVING SMALLEST PREDICTIVE RISK
Ora Bialik and S. Zacks 15 Aug. 1979 20 p refs Prepared in cooperation with Pennsylvania Univ.
(Contract N00014-75-C-0529; NR Proj. 042-276)
(AD-A074376; TR-38) Avail: NTIS HC A02/MF A01 CSCL 12/1

An empirical Bayes procedure is developed for the estimation of critical dosages in the linear regression case. The empirical Bayes procedure provides consistant estimators of the prior parameters when a large number of independent repetitions of the experiment is available. The methodology is developed to analyze a large set of photodynamic bioassays, for the determination of critical air concentrations of benzo-soluble organic extracts. R.E.S.

N80-16730# IIT Research Inst., Chicago, Ill.
BIOLOGICAL EFFECTS OF HIGH-VOLTAGE ELECTRIC FIELDS. VOLUME 1: AN UPDATE Final Report
Jul. 1979 224 p refs
(EPRI Proj. 857-1)
(EPRI-EA-1123) Avail: NTIS HC A10/MF A01

Literature which has become available since mid-1974 on the subject of biological effects of power frequency electric fields was reviewed. Some 2000 new entries of both publications and research programs in progress were identified through a computer-aided literature search. Approximately 50 of these entries are discussed. The general findings of this update confirm the conclusion that it is highly improbable that electric fields from transmission lines have any significant biological effects on healthy individuals who encounter such fields in a normal way under ordinary conditions. However, further research is still needed in order to understand the nature and extent of any effects that could be harmful. DOE

N80-16731# Sinai Hospital, Detroit, Mich.
DEVELOPMENT OF PERCUTANEOUS ENERGY TRANSMISSION SYSTEMS Annual Report, 15 Aug. 1978 - 14 Aug. 1979
A. Kantrowitz, P. S. Freed, A. A. Ciarkowski, F. L. Vaughan (Michigan Univ.), J. I. VeShancey (Michigan Univ.), R. Gray (Michigan Univ.), R. Brabec (Michigan Univ.), and I. Bernstein (Michigan Univ.) 16 Apr. 1979 70 p refs Sponsored in part by National Heart and Lung Inst., Bethesda
(Contract N01-HV-8-2921)
(PB-299739/3; NIH-N01-HV-8-2921-1) Avail: NTIS HC A04/MF A01 CSCL 06B

The initial development of a percutaneous access device is presented. Selected materials were tested for their ability to support cell growth and nutrients were examined for optimizing cell growth and collagen production. To protect the tissue-implant seal from mechanical stresses, alternative surgical techniques were employed to implant a subcutaneous flange. After implanting a flange in a Yucatan miniature pig, forces were applied to the tissue-implant composite. Strain data indicate (1) good fibrotic bonding occurs between the tissue and the implant, and (2) stabilization of the flange with respect to the adjacent dermis. GRA

N80-16732# Saint Elizabeth's Hospital, Brighton, Mass.
DEVELOPMENT OF PRECUTANEOUS ENERGY TRANSMISSION Annual Progress Report, Aug. 1978 - Mar. 1979
Benedict D. T. Daly, Michael Szycher, Michael Worthington, Fred W. Quimby, and Roger G. Warren Apr. 1979 195 p refs
(Contract N01-HV-8-2919)
(PB-300518/8; NIH-N01-HV-8-2919-1) Avail: NTIS HC A09/MF A01 CSCL 06B

A composite percutaneous energy transmission system designed to transmit energy to intracorporeal blood pumps were developed. The system contains five basic components. A carbon

coated titanium flange at the level of the skin to provide a non-reactive surface to promote superficial sinus development. Below this level is a porous polytetrafluoroethylene (PTFE) surface bonded to a polyurethane tube. This PTFE extends onto a radially rigid, vertically flexible polyurethane skirt. Below the skirt is a polyurethane tube with a preformed bend. The remainder of the skirt and tube are coated with Dacron fibrils. The PTFE is designed to promote collagen ingrowth to inhibit epithelial downgrowth. The Dacron velour promotes bonding in depper tissues. GRA

N80-16733# Joint Center for Graduate Study, Richland, Wash.
IMPLANTED ENERGY CONVERSION SYSTEM Annual Report, 1 May 1978 - 1 Mar. 1979
R. P. Johnston, A. Bennett, S. G. Emigh, D. H. Gray, J. R. Noble et al Aug. 1979 491 p refs
(Contract N01-HV-4-2901)
(PB80-101116; JCGS-7908/217; NIH-N01-HV-4-2901-6) Avail: NTIS HC A21/MF A01 CSCL 06L

The JCGS thermal energy converter program objective is to develop clinically useful permanently implantable Stirling/hydraulic power sources to operate heart-assist or full-heart replacement blood pumps. The energy source is heat from an electric heater or from a radioisotope which could provide complete system implantability. Development has progressed through seven system configurations. Stirling Engine 5 has accumulated 6.3 years of operating time and has demonstrated 4.1 years of maintenance-free operation before failure. The short-stroke pump actuator/controller on accelerated life test has demonstrated 6.6 equivalent years of maintenance-free life without failure and accumulated a total of 16.5 equivalent years of operation. System 5 in-vivo test demonstrated circulation of all systemic blood flow throughout 175-hour test. System 6 complete power source demonstrated 15.5 percent efficiency, 1.2 liter volume, and 2.4 kg weight. System 7 engine module has demonstrated 20.1 percent efficiency with 0.2 liter volume and 0.7 kg weight. GRA

N80-16734# Federal Aviation Administration, Atlantic City, N.J. National Aviation Facilities Experimental Center.
MODELING PILOT RESPONSE DELAYS TO BEACON COLLISION AVOIDANCE SYSTEM COMMANDS Final Report, Jul. - Sep. 1977
B. Billmann, T. Morgan, and J. Windle Oct. 1979 34 p refs
(FAA Proj. 052-241-310)
(AD-A075946; FAA-RD-79-74; FAA-NA-79-19) Avail: NTIS HC A03/MF A01 CSCL 05/10

Pilot response delays to collision avoidance commands displayed in the cockpit of a General Aviation Trainer simulator were analyzed. For fixed geometries, velocities, and aircraft response rates, the separation at the point of closest approach between aircraft responsing to collision avoidance system (CAS) commands, is inversely related to the length of pilot delay in responding to the CAS command. The Gamma distribution was the best distribution for approximating the empirical data in terms of minimum error mean square, lack of bias, and uniformity of fit. K.L.

N80-16735 Texas Univ., Galveston.
A STUDY OF OCCUPATIONAL HEAT STRESS BY ANALYSIS OF ENVIRONMENTAL AND HUMAN FACTORS Ph.D. Thesis
David Jefferson Calley 1979 289 p
Avail: Univ. Microfilms Order No. 7927487

The environmental and physiological aspects related to workmen in a hot production process in the warm and humid Gulf Coast region of the United States are described. Heat stress and strain was investigated in terms of three heat stress indices, the heat stress index, the wet bulb globe temperature, and the wet globe temperature. Correlation coefficients between these indices are discussed. In addition, medical data and clinical chemistry of blood and urine among workmen with heat illness was investigated. Recommendations were made for prevention of heat illness and for the use of heat stress indices. Precautions were stated related to the work-rest ratios and the estimation and measurement of metabolism and allowable exposure times.
Dissert. Abstr.

N80-16736 Ohio State Univ., Columbus.
PLANAR BIPED DYNAMICS AND CONTROL Ph.D. Thesis
Andrew Zbigniew Ceranowicz 1979 196 p
Avail: Univ. Microfilms Order No. 8001704

Linear feedback was used to control the motion of a mathematical biped model composed of five rigid links connected by ideal torque actuators at pin joints and constrained to move only in the sagittal plane. The equations of motion for the biped model and support equations, which describe the contact between the supporting surface and the feet of the biped, are presented. These equations can be solved simultaneously for the biped's accelerations and ground reaction forces once the dynamic state and control torques are known. For point feet and a hard flat horizontal support surface, there are nine possible sets of support equations, i.e., support phases. Finding the correct support phase for any control torques and dynamic state is discussed. These ideas were implemented in the simulation of walking which required the transition between three support phases.
Dissert. Abstr.

N80-16737*# Ohio State Univ., Columbus. Human Performance Center and Aviation Psychology Lab.
MULTI-MODAL INFORMATION PROCESSING FOR VISUAL WORKLOAD RELIEF
Michael W. Burke, Richard D. Gilson, and Richard J. Jagacinski 1980 28 p refs
(Grant NsG-2179)
(NASA-CR-162720) Avail: NTIS HC A03/MF A01 CSCL 05H

The simultaneous performance of two single-dimensional compensatory tracking tasks, one with the left hand and one with the right hand, is discussed. The tracking performed with the left hand was considered the primary task and was performed with a visual display or a quickened kinesthetic-tactual (KT) display. The right-handed tracking was considered the secondary task and was carried out only with a visual display. Although the two primary task displays had afforded equivalent performance in a critical tracking task performed alone, in the dual-task situation the quickened KT primary display resulted in superior secondary visual task performance. Comparisons of various combinations of primary and secondary visual displays in integrated or separated formats indicate that the superiority of the quickened KT display is not simply due to the elimination of visual scanning. Additional testing indicated that quickening per se also is not the immediate cause of the observed KT superiority. R.E.S.

N80-16738*# General Technical Services, Inc., Upper Darby, Pa.
THERMODYNAMIC CONSIDERATIONS IN THE SUPPORT OF LIFE FOR LONG SPACE VOYAGES Final Report
A. S. Iberall and S. Z. Cardon Nov. 1979 89 p refs
(Contract NASw-3240)
(NASA-CR-162755) Avail: NTIS HC A05/MF A01 CSCL 06K

The essential requirements for the maintenance of life, particularly human life, on isolated space missions of long duration were investigated through the study of extended irreversible thermodynamics. The characterization of a four trophic level system was developed. Questions of stability are discussed. R.E.S.

N80-16739*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. Structures and Propulsion Lab.
PROSTHETIC DEVICE FOR CORRECTION OF URINARY INCONTINENCE
Ray Helms Dec. 1979 22 p refs
(NASA-TM-78255) Avail: NTIS HC A02/MF A01 CSCL 06B

The development and current status of a prosthetic device for the correction of urinary incontinence is presented.

N80-16740# Monsanto Research Corp., Dayton, Ohio.
PHYSICAL TESTING OF POLYMERS FOR USE IN CIRCULATORY ASSIST DEVICES Annual Report, 1 Jun. 1978 - 31 May 1979
Carl R. McMillin, David L. Sheppard, and Thomas A. Orofino

Jul. 1979 48 p refs
(Contract N01-HV-7-2918)
(PB80-101546; MRC-DA-892; AR-1) Avail: NTIS HC A03/MF A01 CSCL 06L

Fatigue life comparisons of candidate elastomers for use in the artificial heart were made under various conditions. These include: (1) cyclical, progressively increasing, uniaxial strain in air, saline, and in-vitro blood media; (2) progressive uniaxial strain in the same media, with prior cut-growth initiation of samples; and (3) cyclical, biaxial strain in an air environment, accelerated by introduction of various stress concentrators in the samples. Materials evaluated were NBS butyl rubber, Upjohn Pellethane, Goodyear Hexsyn, and Thoratec Biomer. The order of ranking of fatigue lifetime was not the same for the tests cited, and the mode of failure differed for filled (butyl rubber, Hexsyn) and unfilled elastomers. GRA

N80-16741# Bureau of Radiological Health, Rockville, Md. Div. of Electronic Products.
EVALUATION OF COMMERCIALLY AVAILABLE LASER PROTECTIVE EYEWEAR Final Report
Kenneth R. Envall and Ross Murray, Jr. (Laser Effects Branch, USAF School of Aerospace Medicine) May 1979 102 p refs Prepared in cooperation with USAF School of Aerospace Medicine, Brooks AFB, Tex.
(PB80-103039; DHEW/PUB/FDA-79/8086; FDA/BRH-79/110) Avail: NTIS HC A06/MF A01 CSCL 06Q

Forty commercially available laser protective eyewear materials and ten representative frames were evaluated under non-stress and stress conditions. Parameters such as optical density, spectral transmission, luminous transmittance, refractive and prismatic effects haze, and impact resistance were determined and, where possible, compared to recommended criteria for occupational eye and face protection. In addition, all materials were subjected to shelf-life, environmental, and laser-induced damage tests to determine damage limits and characteristics. GRA

N80-17665 Michigan State Univ., East Lansing.
INTERACTION OF ELECTROMAGNETIC FIELDS WITH HETEROGENEOUS BIOLOGICAL SYSTEMS Ph.D. Thesis
Sutus Rukspollmuang 1979 207 p
Avail: Univ. Microfilms Order No. 8001585

The theoretical and experimental results of the induced electric field inside a biological system when it is irradiated by a non-ionized electromagnetic (EM) radiation are presented. A numerical method based on a tensor integral equation is outlined for estimating the induced EM heating. A phantom model of man which was constructed with thin plexiglass filled with phantom material, was irradiated by 500 to 3000 MHz EM waves in a microwave anechoic chamber. The distribution of the measured electric field was compared with the distribution of theoretical results obtained numerically from the tensor integral equation method. A quantitative agreement was obtained between experiment and theory. A study was also conducted to investigate effective methods of inducing hyperthermia in the tumors embedded in animal and human bodies by utilizing EM fields. Dissert. Abstr.

N80-17666*# National Aeronautics and Space Administration, Washington, D. C.
NEW STUDIES OF VENUS
L. V. Ksanfomaliti Feb. 1980 18 p Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 4, Jul. - Aug. 1979 p 5-14 Transl. by JPRS, Arlington, Va.
(NASA Order W-13183)
(NASA-TM-75931) Avail: NTIS HC A02/MF A01 CSCL 03B

The American and Russian 1978 Venus explorations are reported. Highlights of their accomplishments and subjects of study are discussed. Included are investigations of the surface pressure, temperature, composition, and mass of the Venusian atmosphere, along with cloud layer structure, greenhouse effect, and diurnal variations. M.M.M.

N80-17667*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF GRAVITATIONAL OVERLOADS, HYPOKINESIA AND HYPODYNAMIA ON THE VESSELS OF THE PULMONARY BLOOD CIRCUIT
A. A. Kasimtsev Feb. 1980 13 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. Embriol. (USSR), no. 2, 1973 p 82-90 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prepared by 1st Leningrad I. M. Pavlov Medical Inst.
(Contract NASw-3199)
(NASA-TM-75963) Avail: NTIS HC A02/MF A01 CSCL 06C

Vessels of the pulmonary circuit are studied under normal conditions, in exposure to single stress or continuous threshold endurable chestspine gravitational stresses, and one to eight weak hypokinesia and hypodynamic effects followed by stress. Examination methods include rentgenography and micro-rentgenography, clearing, and histology. In exposure to gravitational stress the distal portions of the arterial vessels of the 3 and 4 orders constrict, while all veins dilate. Sinuosity of all vessels is noted. The volume of the capillary bed increases and signs of perivascular edema occur. Due to hypokinesia and hypodynamia the arteries constricted and the arterial bed becomes poor. The veins of all orders dilate and the volume of the capillary bed increases. The changes grew greater the longer the terms of hypodyamic effects. Successive combination of hypokinesia and hypodynamia and gravitational stresses cause more pronounced changes than separate effects of these two factors and result in great deformity of the vascular walls, including their rupture and penetration of formed elements beyond the limits of the vascular bed. M.G.

N80-17668*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF GRAVITATIONAL ACCELERATION, HYPOKINESIA AND HYPODYNAMIA ON THE STRUCTURE OF THE INTESTINAL VASCULAR BED
M. V. Nikitin Feb. 1980 12 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. Embriol. (USSR), no. 3, Mar. 1974 p 54-61 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prepared by 1st Leningrad I. P. Pavlov Medical Inst.
(Contract NASw-3199)
(NASA-TM-75972) Avail: NTIS HC A02/MF A01 CSCL 06C

A series of experiments comparing single and combined effects of hypokinesia and gravitational acceleration on morphology of intestinal blood vessels are discussed. Results indicate that hypokinesia has a whole body nonspecific effect reflected even in an organ whose activity shows little or no change due to hypokinesia. In early hypokinetic stages blood redistribution caused anorexia, intestinal atonia, and secretory disruption. Destructive changes from further exposure include aneurisms, varicoses, extravascular movement of blood elements, and vascular wall muscle fiber degeneration. The effect of acceleration is greatest in the ventrodorsal direction. Changes due to acceleration then hypokinesia are like those due to hypokinesia alone; changes due to acceleration before and after hypokinesia are like those due to acceleration. Adaptation raises acceleration tolerance but the effects do not survive four-week hypokinesia. M.G.

N80-17669*# National Aeronautics and Space Administration, Washington, D. C.
INFLUENCE OF MOBILITY RESTRICTION ON HABITUATION OF THE VESTIBULAR APPARATUS
G. I. Gorgiladze and G. S. Kazanskaya Feb. 1980 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 211, no. 4, 1 Aug. 1973 p 1005-1008 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75995) Avail: NTIS HC A02/MF A01 CSCL 06C

Test results presented indicate that 30-day hypokinesia did not affect the intensity of nystagmus: velocity of slow phase, total number of jerks, and duration of the reaction in animals were the same as before mobility restriction and did not differ from those of the control group. However, hypokinesia resulted in

the disappearance of habituation of the vestibulary system to repeated angular accelerations. The known hypokinetic changes in the endocrine system were studied. It was concluded that reduction in adrenergic function may be the cause of disappearance of vestibular apparatus habituation during hypokinesia. M.M.M.

N80-17670*# National Aeronautics and Space Administration, Washington, D. C.
RNA CONTENT IN MOTOR AND SENSORY NEURONS AND SURROUNDING NEUROGLIA OF MOUSE SPINAL CORD UNDER CONDITIONS OF HYPODYNAMIA AND FOLLOWING NORMALIZATION
V. A. Brumberg and L. A. Pevzner Feb. 1980 15 p refs
(Contract NASw-3198)
(NASA-TM-76032) Avail: NTIS HC A02/MF A01 CSCL 06C

The differences in the dynamics of reparative processes in RNA metabolism within the neuron-neuroglia unit after the cessation of hyper- and hypodynamia is dicussed. The role of neuroglia is stressed in compensatory, reparative and trophic processes in the nervous system as well as the possibility in an adaptation at the cellular level. M.M.M.

N80-17671*# National Aeronautics and Space Administration, Washington, D. C.
DIFFERENTIATION AND RADIOSENSITIVITY OF HEMOPOIETIC STEM CELLS OF MICE DURING HYPOKINESIA
V. N. Shvets 1980 10 p refs Transl. into ENGLISH from Radiobi. (USSR), v. 19, no. 2, 1979 p 199-203 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76066) Avail: NTIS HC A02/MF A01 CSCL 06C

The potential for differentiation and radiosensitivity of the stem hemopoietic cells (KOE) under conditions of initial and later hypokinesia is examined. It is established that in the initial period of hypokinesia (3 days) when a stress reaction prevails, changes occur in the erythroid differentiation and radiosensitivity of KOE. This effect is associated with redistribution of T-lymphocytes that increase in number in the bone marrow of mice during hypokinesia. At later periods of hypokinesia (30 days) when changes in the organism are related to hypokinesia proper, differentiation and radiosensitivity of KOE were normalized. M.G.

N80-17672*# National Aeronautics and Space Administration, Washington, D. C.
DYNAMICS OF CHANGE IN RAT ARTERIAL PRESSURE UNDER CONDITIONS OF IMMOBILIZATION
Ye. A. Yumatov, Yu. G. Skotselyas, and L. I. Ivanona Feb. 1980 9 p refs Transl. into ENGLISH from Patol. Fiziol. Eksp. Ter. (USSR), no. 3, 1979 p 22-26 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original Doc. prepared by USSR Academy of Medical Sciences, Moscow
(Contract NASw-3198)
(NASA-TM-76045) Avail: NTIS HC A02/MF A01 CSCL 06C

Emotional stress developed in immobilized rats was shown to be accompanied by changes in the regulation of arterial pressure and the frequency of cardiac contractions. A group of adapting rats displayed definite resistance to emotional stress, while a group of rats incapable of adapting to acute emotional stress died with characteristics of cardiovascular insufficiency. The mechanisms providing resistance to emotional stress in numerous conflict situations were analyzed. K.L.

N80-17673# Rhode Island Univ., Kingston. Graduate School of Oceanography.
BIOCHEMICAL CORRELATES OF SEASONAL CHANGE IN MARINE COMMUNITIES
H. Perry Jeffries May 1979 19 p refs Repr. from Am. Nat., v. 113, no. 5, May 1979 p 643-658
(Grant NOAA-04-80-MO1-147)
(PB-301380/2; Marine-Reprint-119; NOAA-79082402) Copyright. Avail: NTIS HC A02/MF A01 CSCL 06B

Changes in the fatty acid distributions of plankton and benthos in response to seasonal change are analyzed. It is found that as a temperate community matures and becomes more complex, so does its fatty acid composition. Chemical progression is most rapid during succession from winter-spring to summer-fall species groups, a period of reorganization among characteristic fatty acid sets. Increasing amounts of saturated acids seem to disclose a change in community structure, whereas an important polyunsaturate forms a locus around which these progressions take place. GRA

N80-17674# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 14, NO. 6, 1979
O. G. Gazenko, ed. 31 Jan. 1980 114 p refs Transl. into ENGLISH of Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 90 p
(JPRS-75041) Avail: NTIS HC A06/MF A01

The biological and physiological effects of manned space flight are addressed. Specifically, the selection and training of cosmonauts, the evaluation and analysis of data to facilitate the transition from orbital to interplanetary flights, and research aimed at guaranteeing safety on long flights and reliability of the human component of the man spaceship system are considered. Space psychology and physiology, environmental problems and control, and telemetry are included.

N80-17675# Joint Publications Research Service, Arlington, Va.
SOME PHILOSOPHICAL ASPECTS OF THE PROBLEM OF MAN, THE BIOSPHERE AND SPACE
N. A. Agadzhanyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 1-8 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 1-9

Avail: NTIS HC A06/MF A01

Man environment interactions are considered in terms of the laws governing evolution and further development of the Universe. The emergence of a human society is seen as a qualitatively new stage in the evolution of organic matter. Progress in science and engineering is discussed in relation to the effect on the natural environment and on living beings. Space exploration is seen as an opportunity to evaluate man's role, position, and responsibility in the infinite Universe. J.M.S.

N80-17676# Joint Publications Research Service, Arlington, Va.
COMPOSITION OF INTESTINAL MICROFLORA OF COSMONAUTS BEFORE AND AFTER SPACE FLIGHTS
N. N. Lizko, V. M. Shilov, G. D. Syrykh, and V. I. Legenkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 9-20 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 9-13

Avail: NTIS HC A06/MF A01

The composition of the intestinal microflora of 12 cosmonauts was studied before and after space missions of varying duration. Changes in the intestinal microbial coenosis were found prelaunch. The pattern of changes did not vary with an increase in space flight duration. The use of special prophylactic measures exerted a positive effect on intestinal microecology. Bifidobacteria and lactobacilli showed the greatest changes inflight. Therefore, it seems important to arrange preflight sanation of the intestinal microflora as a prophylactic method. Author

N80-17677# Joint Publications Research Service, Arlington, Va.
OBJECTIVES AND CONDITIONS OF PHYSIOLOGICAL EXPERIMENTS ON RATS CONDUCTED ABOARD THE COSMOS-936 BIOSATELLITE
Ye. A. Ilin, V. I. Korolkov, A. R. Kotovskaya, A. D. Noskin, V. A. Kondratyeva, A. A. Shipov, and I. I. Britvan *In its* USSR Rept.:

Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 21-26 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 18-22

Avail: NTIS HC A06/MF A01

Results of physiological studies of rats flown onboard the biosatellite Cosmos 936 are summarized. The satellite-borne experiments investigated the mechanisms of the physiological effects of weightlessness, and considered artificial gravity as an effective means of preventing the adverse effects of weightlessness. The feasibility of a control group that would be exposed to all space flight factors, with the exception of weightlessness, in order to differentiate between in the influence of weightlessness on physiological systems and the effects of other space flight factors was assessed. J.M.S.

N80-17678# Joint Publications Research Service, Arlington, Va.

SOME NEUROCHEMICAL CHARACTERISTICS OF RATS DURING FLIGHT ABOARD THE COSMOS-782 ARTIFICIAL SATELLITE AND AFTER RETURN TO EARTH

O. G. Gazenko, N. N. Demin, A. N. Panov, D. A. Rashevskaya, N. L. Rubinskaya, and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 27-32 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 22-26

Avail: NTIS HC A06/MF A01

The brains of rats flown onboard the biosatellite Cosmos 782 were sampled immediately postflight and taken under neurochemical study. It was shown cytospectrophotometrically that the absolute content of RNA decreased by 20 percent in the cytoplasm of cerebellar Purkinje cells and remained unaltered in glial cells-satellites, and that the protein content did not change. In the frontal cortex (homogenates) the concentration of sulfhydryl groups decreased by 26 percent, activity of nonspecific cholinesterase by 30 percent and acetyl cholinesterase by 33 percent. The activity of the latter in the cerebellum also diminished. Author

N80-17679# Joint Publications Research Service, Arlington, Va.

EFFECTS OF MINIMAL GRAVITATIONAL LOADS ON FLUID-ELECTROLYTE METABOLISM AND RENAL FUNCTION OF MAN DURING PROLONGED IMMERSION

A. I. Grigoryev and Ye. B. Shulzhenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 33-39 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 27-31

Avail: NTIS HC A06/MF A01

It was demonstrated that renal excretion of fluid, osmotically active substances and electrolytes could be reduced, using low gravitational exposures (+Gz). The degree and duration of water and electrolyte retention were different with respect to the experimental time. The major physiological mechanisms of the changes in fluid-electrolyte metabolism were: a decrease in the glomerular filtration rate and a change in water and ion transport in renal tubules. Author

N80-17680# Joint Publications Research Service, Arlington, Va.

CREATINURIA IN MAN DURING PROLONGED HYPOKINESIA

S. A. Kamforina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p40-44 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 32-35

Avail: NTIS HC A06/MF A01

A prolonged bed rest experiment of 94 days caused an increase in renal excretion of creatine during the first two months and a return to the pretest level during the third month. The bed rested test subjects who performed exercise showed a lower and delayed (by the 3rd month) increase in creatine excretion. Author

N80-17681# Joint Publications Research Service, Arlington, Va.

CHANGES IN THE NEUROMOTOR SYSTEM DURING 45 DAYS OF HYPOKINESIA

Ye. A. Shaposhnikov, P. I. Sidorov, and A. I. Kolomenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 45-51 refs Transl. into ENGLISH from Kosmich. Biol. Aviatkomich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 35-39

Avail: NTIS HC A06/MF A01

Neurological and electromyographic examinations of 12 test subjects during a 45 day bed rest study were carried out. Symptoms indicating changes in the suprasegmentary innervation were noted. Shortening of the duration of potentials was shown by needle electromyography. A decline in the threshold of H-reflex and a change in the frequency parameters of EMG were seen. These data suggest a change in the functional state of the central and peripheral motor neuron during prolonged hypokinesia. Prophylactic efficiency of muscle electrostimulation is discussed. Author

N80-17682# Joint Publications Research Service, Arlington, Va.

ELECTROSTIMULATION OF MUSCLES FOR THE PREVENTION OF NEUROMUSCULAR DISORDERS DURING 45-DAY ANTIORTHOSTATIC HYPOKINESIA

V. S. Georgiyevskiy, Ye. A. Ilinskaya, V. I. Matveyev, V. M. Mikhaylov, and V. I. Pervushin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 52-57 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 40-44

Avail: NTIS HC A06/MF A01

Healthy test subjects exposed to a 45 day head down tilting (-6.5 deg) showed a decline of the tone and strength of certain muscle groups, a decrease of leg circumference, a deterioration of the walking pattern, and a reduction of exercise tolerance (provocative tests with bicycle ergometry pedalling at a moderate and maximum rate). Electrostimulation of muscles applied by the Tonus-2 equipment for 30 min twice a day, 6 days a week helped to reduce the level of hypokinesia induced disorders. Author

N80-17683# Joint Publications Research Service, Arlington, Va.

EFFECT OF VESTIBULAR STIMULI ON VISUAL TRACKING IN A LIMITED TRACKING AREA

V. I. Babiyak, Yu. N. Kholodov, and Yu. K. Yanov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 58-63 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov/Dec. 1979 p 49-48

Avail: NTIS HC A06/MF A01

The results of studying visual tracking of targets which moved with a constant amplitude of angular displacement are presented. The tracking was carried out during an interaction of vestibular and optic sensors. The tracking stability was related to the coincidence of the direction of vestibular and optic stimuli. J.M.S.

N80-17684# Joint Publications Research Service, Arlington, Va.

ROLE OF INTEROCEPTIVE AFFERENTATION IN FUNCTION OF THE CORTEX OF THE VISUAL ANALYZER

N. I. Pityk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 64-71 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 48-53

Avail: NTIS HC A06/MF A01

The experiments on diplacin-immobilized rats showed that stimulation of gastric and rectal mechanoreceptors caused noticeable changes in the control and light-induced impulse activity of neurons of the optic cortex. The predominant pattern of cell reactions were tonic changes of impulsation. They included both stimulatory and inhibitory effects. The latter occurred mostly as a result of stimulation of gastric mechanoreceptors. Changes in the evoked activity of those neurons involved most frequently enhancement or inhibition of responses, contrasting and stabilization of short-latent responses, and then masking with neuronal noise. The functional importance of the changes in the control and evoked activities of neurons of the optic cortex during interoceptive effects as well as possible central pathways of their realization in the optic cortex is discussed. R.E.S.

N80-17685# Joint Publications Research Service, Arlington, Va.

EFFECT OF ACUTE HYPOXIA ON SPECIFIC AND NONSPECIFIC SYSTEMS OF THE RABBIT BRAIN

N. S. Akopyan and O. G. Baklavadzhyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 72-78 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 53-57

Avail: NTIS HC A06/MF A01

Electrical activity of the brain under hypoxic activity was studied with the use of the EEG. At a simulated altitude of 8500-9000 m, an increase in the amplitude of the early positive and negative phase of the thalamic-cortical evoked potentials, and a slight prolongation of the latent period were seen. Changes in the reticulo-cortical and hypothalamo-cortical evoked potentials included a pronounced inhibition of their negative phase. In the EEG slow delta-waves increased gradually, becoming the major rhythm. The presence of EEG signs of the development of inhibitory processes in the cortex suggested that the changes in evoked potentials were also a result of inhibition of cortical neurons. Hypoxia-adapted rabbits tolerated acute hypoxia much better. They exhibited less pronounced changes in the electric manifestations of the function of specific and nonspecific projection systems of the brain. R.E.S.

N80-17686# Joint Publications Research Service, Arlington, Va.

STUDY OF BIOELECTRIC ACTIVITY OF NEURO-MUSCULAR AND SYMPATHETIC SYSTEMS DURING EXPOSURE TO A STEADY MAGNETIC FIELD

L. D. Klimovskaya and S. B. Krotova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 79-84 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 58-61

Avail: NTIS HC A06/MF A01

The experiments on an isolated frog neuromuscular preparation showed that an exposure to stable magnetic fields of 1000-4000 Oe did not influence the time parameters, amplitude and pattern of the action potentials of the gastrocnemius muscle induced by ischiatic nerve simulation with single impulses. Similar results were obtained from an analysis of electric responses of the upper cervical sympathetic node to the stimulation of preganglionar fibers in in situ experiments on urethane anesthesized rabbits subjected to a total exposure of a stable magnetic field (500-3000 Oe). In addition, an exposure to a stable magnetic field of 4000 Oe brought about a decrease of the level of depression of the action potential of muscles after conditioning tetanus. R.E.S.

N80-17687# Joint Publications Research Service, Arlington, Va.

EFFECTS OF STRONG INFRALOW-FREQUENCY MAGNETIC FIELDS ON BONE MARROW CELL DIVISION

A. D. Strzhizhovskiy, G. V. Galaktionova, and P. A. Cheremnykh *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 85-88 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 61-63

Avail: NTIS HC A06/MF A01

The effect of an infralow frequency field of 3-127 kOe applied for 1 hr on mitotic activity, frequency of chromosomal aberrations and number of bone marrow cells of mice was studied. The exposure of mice to fields of 3 and 8 kOe stimulated and to fields of 54 and 127 kOe inhibited mitotic activity. No increase in the frequency of aberrant mitoses in bone marrow cells was noted. The changes in the cell number were small (no more than 20 percent) and readily reversible. Author

N80-17688# Joint Publications Research Service, Arlington, Va.

PROGRAMMED CONTROL OF THE AUTOTROPHIC COMPONENT OF AN ECOLOGICAL SYSTEM THAT IS CLOSED WITH REGARD TO EXCHANGE OF GASES

A. S. Nasonov and V. S. Toroptsov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 89-95 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 63-68

Avail: NTIS HC A06/MF A01

The ecological system with closed gas exchange consisting of autotrophic and heterotrophic components located in different rooms was studied. The conditions of O2 and CO2 steady state with a periodically working autotrophic component were found. The stability of the steady-state was analyzed. Author

N80-17689# Joint Publications Research Service, Arlington, Va.

EFFECT OF CARBON MONOXIDE ON ANIMALS ADAPTED TO HYPOXIC HYPOXIA

V. V. Kustov and V. G. Litau *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 98-102 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 69-72

Avail: NTIS HC A06/MF A01

Experiments were conducted on 80 white male mice to investigate the development of carbon monoxide poisoning in animals adapted to hypoxic hypoxia. The following parameters were studied: body weight, hemoglobin and erythrocyte content of peripheral blood, blood catalase activity, blood peroxidase activity, and increment of carboxyhemoglobin. The results show that carbon monoxide in a concentration of 500 mg/cu m induces substantial changes in mice referable to several integral (body weight), hematological, and enzymatic parameters which are inherent in chronic carbon monoxide poisoning. R.E.S.

N80-17690# Joint Publications Research Service, Arlington, Va.

EFFECT OF STEADY MAGNETIC FIELD ON SOME ASPECTS OF ENERGY AND NITROGEN METABOLISM IN THE RAT CEREBRAL HEMISPHERES

Ye. A. Nosova and L. M. Kurkina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 103-105 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 72-74

Avail: NTIS HC A06/MF A01

The effects of high intensity steady magnetic fields (SMF) on ammonia, glutamine, glutamic, aspratic and gamma-aminobutyric [GABA] acids were studied, as well as concentration levels of adenisine triphosphoric acid (ATP), phosphocreatine and lactic acid in the cerebral hemispheres of rats. Exposure of animals to SMF of 3000 Oe for 3 hours did not lead to reliable changes in levels of components of the glutamine-glutamic acid system, or in aspartic acid and GABA. The ATP content of brain tissue of rats exposed to SMF was reliably, though not markedly, decreased; phosphocreatine was unchanged, while lactic acid content was significantly increased. The decrease demonstrated in ATP content of the cerebral hemispheres to the bottom range of normal and increase in lactic acid to the top range of normal are indicative of greater activity of metabolic processes in the central nervous system of rats exposed to SMF, as compared to control animals. R.E.S.

N80-17691# Joint Publications Research Service, Arlington, Va.

EFFECT OF RHEOPOLYGLUCIN ON BLOOD CLOTTING FACTORS OF THE AORTA, MYOCARDIUM AND VENAE CAVAE DURING HYPOKINESIA

V. I. Inchina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 106-110 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 74-76

Avail: NTIS HC A06/MF A01

The influence of low molecular dextrans on blood clotting and fibrinolytic peoperties of blood vessels and the myocardium under hypokinetic conditions was studied. The low molecular dextran used was rheopolyglucin. Constriction of the arteriolar lumen, dilatation of venules, appearance of recessed sacculations and increased capillary permeability were found in the myocardium of hypokinetic rabbits. These changes in the vascular wall, combined with demonstrated changes in the tissular system of hemostasis, lead to impairment of microcirculatory hemostasis. Rheopolyglucin, which normalizes the rheological properties of blood and diminishes aggregation of formed elements, improved microcirculation. However, complete restoration of circulation only occurred when capillaries were free of fibrin. R.E.S.

N80-17692# Joint Publications Research Service, Arlington, Va.

EFFECTS OF ACCELERATIONS ON THE EARLY STAGE OF RADIATION LESION IN ANIMALS

V. V. Antipov, D. N. Gavrilyuk, B. L. Razgovorov, and B. I. Davydov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 111-114 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), Vol. 14, No. 6, Nov./Dec. 1979 p 76-77

Avail: NTIS HC A06/MF A01

The influence of accelerations on the course of the body's primary reaction to the combined effect of accelerations and ionizing radiation was studied. The results of experiments on rats and dogs show that exposure to accelerations prior to radiation attenuates the primary reaction of both rats and dogs. Exposure to accelerations of irradiated animals induced effects in different directions: attenuation of gastro-intestinal tract disturbances at the early stage of radiation lesion in rats, and intensification of some manifestations of the primary reaction in dogs. R.E.S.

N80-17693# Joint Publications Research Service, Arlington, Va.

TEST IRRADIATION OF CHRONICALLY IRRADIATED DOGS FOR EVALUATION OF HEMOPOIETIC SYSTEM FUNCTION

T. Ye. Burkovskaya and B. A. Markelov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 115-119 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 78-80

Avail: NTIS HC A06/MF A01

In order to determine the severity of lesion and state of compensatory mechanisms of the hemopoietic system, acute irradiation was used as a used functional load. Male mongrel dogs were kept in a Co gamma field for 6 years. The results show functional deficiency of myeloid hemopoiesis in dogs submitted to long term chronic radiation; this deficiency was not demonstratable in ordinary morphological examinations of blood and bone marrow. The obtained results are indicative of a reduction in the bone marrow reserve of mature granulocytes, and this is more marked in dogs preirradiated in a dose of 1130 rad, as well as disturbances in the system of postradiation renewal of granulocyctes. Repair and compensatory-adaptive capabilities remain at a rather high level in the erythroid system. R.E.S.

N80-17694# Joint Publications Research Service, Arlington, Va.

INSOLUBLE COLLAGEN CONTENT OF DOG TISSUES AFTER EXPOSURE TO LOW DOSES OF CHRONIC GAMMA RADIATION

Z. A. Vinogradova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 14, No. 6, 1979 (JPRS-75041) 31 Jan. 1980 p 120-122 Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), vol. 14, no. 6, Nov./Dec. 1979 p 80-82

Avail: NTIS HC A06/MF A01

The effect of chronic irradiation on metabolism of collagen proteins was studied by assaving the insoluble collagen content of animal tissues at different stages of a chronic experiment. The results show a decrease in insoluble collagen content of organs and tissues (lungs, aorta, liver, tendon, cartilage and skin) of irradiated dogs as the accreted dosage increased. The results also show age-related changes with respect to collegen content. R.E.S.

N80-17695*# North Carolina State Univ., Raleigh. Neuropsychology Lab.

AROUSAL FROM SLEEP: THE UNIQUENESS OF AN INDIVIDUAL'S RESPONSE AND THE PROBLEM OF NOISE CONTROL Final Report

T. E. LeVere 1979 48 p refs
(Grant NGL-34-002-095)
(NASA-CR-162747) Avail: NTIS HC A03/MF A01 CSCL 06P

The dynamic nature of sleep is reviewed. Research is then presented concerning two fundamental issues: (1) does an individual react differently to auditory sounds when asleep as compared to when the individual is awake and (2) does sleep disruption necessarily involve behavioral awakening? R.E.S.

N80-17696*# General Electric Co., Hudson Falls, N.Y. Space Division.

BIOMEDICAL SYSTEMS ANALYSIS PROGRAM Final Report

31 Dec. 1979 72 p refs
(Contract NAS9-15487)
(NASA-CR-160456; TIR-741-LSP-9025) Avail: NTIS HC A04/MF A01 CSCL 06B

Biomedical monitoring programs which were developed to provide a system analysis context for a unified hypothesis for adaptation to space flight are presented and discussed. A real-time system of data analysis and decision making to assure the greatest possible crew safety and mission success is described. Information about man's abilities, limitations, and characteristic reactions to weightless space flight was analyzed and simulation models were developed. The predictive capabilities of simulation models for fluid-electrolyte regulation, erythropoiesis regulation, and calcium regulation are discussed. R.E.S.

N80-17697*# National Aeronautics and Space Administration, Washington, D. C.

SPACE FLIGHT RESEARCH RELEVANT TO HEALTH, PHYSICAL EDUCATION, AND RECREATION: WITH PARTICULAR REFERENCE TO SKYLAB'S LIFE SCIENCE EXPERIMENTS Final Report

Wayne D. VanHuss (Michigan State Univ., East Lansing) and William W. Heusner (Michigan State Univ., East Lansing) Jun. 1979 56 p refs
(NASA-EP-148) Avail: NTIS MF A01; SOD HC EP1.19:148 CSCL 06P

Data collected in the Skylab program relating to physiological stresses is presented. Included are routine blood measures used in clinical medicine as research type endocrine analyses to investigate the metabolic/endocrine responses to weightlessness. The daily routine of physical exercise, coupled with appropriate dietary intake, sleep, work, and recreation periods were considered essential in maintaining the crew's health and well being. M.M.M.

N80-17698# Research Inst. of National Defence, Linkoeping (Sweden).

IMPROVED PILOT TRAINING THROUGH MODIFICATION OF SELECTION AND TRAINING PROCEDURES

Leif Carlstedt Mar. 1979 15 p refs In SWEDISH; ENGLISH summary

(FOA-C-55029-H7) Avail: NTIS HC A02/MF A01

Modifications in selection procedures and training environment for military basic flight students have improved the ratio of selected to passed from .40 to .80 during the past decade. Applicants are screened in six stages. Test and assessment data are examined using the conjunctive multiple cutoff method. The selection process is a synthesis of characterlogical and compositional models. Changes in the training environment may cause loss of validity in some tests results. Author (ESA)

N80-17699# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

PROPOSED NATIONAL EXPOSURE LIMITS FOR MICROWAVE AND RADIOFREQUENCY RADIATION

G. Campos Venuti, M. Grandolfo, and G. Mariutti 31 Jan. 1979 100 p refs In ITALIAN; ENGLISH summary Presented at the Conv. Naz. dell' Assoc. Ital. di Fis. Sanitaria e Protezione Contro le Radiazioni, Rome, 30-31 Oct. 1978

(ISS-P-79/2) Avail: NTIS HC A05/MF A01

At present in Italy no statutory requirements or recommendations are enforced with respect to maximum permissible levels of microwave and radio frequency radiation to which either the general public or workers may be exposed. After a brief survey of current scientific data, a rationale for adopting permissible levels in the frequency range 100 kHz to 300 gHz is presented. Comparisons with other national and international standards are made. Author (ESA)

N80-17700# Istituto Superiore di Sanita, Rome (Italy). Lab. delle Radiazioni.

INTERCOMPARISON OF ISS AND BIPM PRIMARY EXPOSURE STANDARDS FOR MEDIUM ENERGY X-RAYS

E. Casnati (Inst. di Fis. dell' Univ., Ferrara, Italy), L. Pugliani, and P. Salvadori 26 Feb. 1979 58 p refs

(ISS-R-79/3) Avail: NTIS HC A04/MF A01

The primary exposure standards of the Istituto Superiore di Sanita and the Bureau International des Poids et Measures in the medium energy X-ray range were compared. After a description of the X-ray qualities on which the comparison was based, how the quantities appearing in the exposure definition were evaluated is explained and the aspects typical of the phenomenological realization of the exposure unit are listed. The properties of the X-ray beam, the correction factors applied to the free-air chamber measurements for obtaining the unit of exposure, the peculiarities and response of the transfer cavity chamber, and the calibration of the latter are discussed. The final results of the comparison are shown then compared with results reported by other laboratories. Author (ESA)

N80-17701# National Technical Information Service, Springfield, Va.

THE TOXICOLOGY OF OZONE. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Nov. 1979

Elizabeth A. Harrison Nov. 1979 132 p Supersedes NTIS/PS-78/1120

(PB80-800881; NTIS/PS-78/1120) Avail: NTIS HC $30.00/MF $30.00 CSCL 06T

The studies cited cover the toxic effects of ozone on humans, animals, and plants. Although many reports cite the effects of ozone generated as a photochemical oxidant from air pollution, others simply look at the basic biological effects of ozone without discussing its source. The topics described include ozone's effects on forests and agricultural crops, industrial exposure, maximum exposure levels, effects on microorganisms, and physiological effects. This updated bibliography contains 126 abstracts, 41 of which are new entries to the previous edition. GRA

N80-17702# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

THE SURVIVAL AND PROTECTION OF EQUIPMENT IN THE EVENT OF ACCIDENTAL IMMERSION IN COLD WATER

C. Boutelier Jan. 1979 125 p refs In FRENCH

(AGARD-AG-211-FR) Avail: NTIS HC A06/MF A01

The physiological reactions of the human body to thermal aggression and eventual pathological incidences and their treatment are described for airmen and designers of equipment designed for protecting pilots against cold water following accidental immersion. Topics covered include: (1) heat transfer from the human body in ambient cold by conduction, convection, evaporation, and radiation; (2) the physiological response to immersion - tolerance and acclimatization; (3) diagnosis and treatment of local and general effects of cold, including hypothermia; (4) the theoretical basis for protective clothing; (5) methods for evaluating protective clothing; and (6) the design and construction of anti-immersion equipment: wet suits, dry suits, life vests, and lifeboats. Transl. by A.R.H.

N80-17703# Research Inst. of National Defence, Linkoeping (Sweden).

COMPENSATORY AND CONJUNCTIVE PROCESSING OF TEST INFORMATION FOR PREDICTION OF RESULTS OF MILITARY FLIGHT TRAINING [KOMPENSATORISK OCH KONJUNKTIV BEHANDLING AV TESTINFORMATION FOER PREDIKTION AV RESULTAT PAA MILITAAR FLYGUTBILDNING]

Leif Carlstedt Mar. 1979 28 p refs In SWEDISH

(FOA-C-55025-H7) Avail: NTIS HC A03/MF A01

Data collected during aircraft pilot selection tests were analyzed by two different methods to determine the predictive ability of each to military flight training. The comparison was made using data from four groups using a compensatory and a conjunctive method. The conjunctive or cross validation method gave better predictions in three of the four groups, but the compensatory or regression analysis method gave better results in the fourth group. Author (ESA)

N80-17704# Research Inst. of National Defence, Linkoeping (Sweden).

STEPWISE PILOT SELECTION: PROCEDURE AND VALIDITY [STEGVIST URVAL AV FLYGFOERARE: PROCEDUR OCH VALIDITET]

Leif Carlstedt Mar. 1979 18 p refs In SWEDISH

(FOA-C-55026-H7) Avail: NTIS HC A02/MF A01

A graduated selection method used since 1970 to select Swedish military pilots is described and compared with previous practice. Formerly, all test data were weighted equally at all stages of the selection process, but now the data are quantified by an expectancy hypothesis at the beginning of the selection process. Also, the personality test defense mechanism test has been introduced as a selection instrument. Using the graduated or stepwise method has improved the selection rate from 45 to 56 men trained per 20 selected, to 41 men trained per 20 selected. Author (ESA)

N80-17705# Research Inst. of National Defence, Linkoeping (Sweden).

THE INFLUENCE OF THE CHANGE OF FLIGHT INSTRUCTION AND HIS ABILITY UPON THE PUPIL'S ADAPTATION TO FLYING [INVERKAN AV FLYGLAERARBYTGN OCH FLYGLAERARENS KVALITET PAA ELEVENS ANPASSNING TILL FLYGNING]

Leif Carlstedt Mar. 1979 20 p refs In SWEDISH

(FOA-C-55027-H8) Avail: NTIS HC A02/MF A01

The importance of the frequency of the changes of flight teacher and of his quality on the pupil's adaptation to flying is studied. It is shown that students having fewer than five flying tests with the same teacher during the 20 first flying hours are expected to fail more often than those who have more than five with the same teacher. The pupil's adaptation to flying (measured by a questionaire) is related to the improvements made at the beginning of the training period. In most cases students adapting well have had teachers rated as good in the flying school. Author (ESA)

N80-17706# Research Inst. of National Defence, Linkoeping (Sweden).
IMPROVED FLIGHT TRAINING METHODS [OPERATION KVALITETSHOEJNING AV FLYGFOERARPRODUKTIONEN]
Leif Carlstedt and F. Paul Johansson Mar. 1979 49 p refs In SWEDISH
(FOA-C-55028-H8) Avail: NTIS HC A03/MF A01

The evolution of methods used in military pilot training is presented along with a discussion and evaluation of Swedish practices. An experiment is described in which the trainee group is given a distinctive name and exposed to a training cadre which was highly motivated at all levels of command. The long term project showed increases in pilot selection success ratio.
Author (ESA)

N80-17707# National Technical Information Service, Springfield, Va.
INFORMATION PROCESSING IN HUMANS, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Nov. 1977 - Nov. 1979
Elizabeth A. Harrison Nov. 1979 123 p supersedes NTIS/PS-78/1154; NTIS/PS-77/1042; NTIS/PS-76/0947; NTIS/PS-75/858; NTIS/PS-75/087
(PB80-800931; NTIS/PS-78/1154; NTIS/PS-77/1042; NTIS/PS-76/0947; NTIS/PS-75/858; NTIS/PS-75/087) Avail: NTIS HC $30.00/MF $30.00 CSCL 05J

Psychophysiology, memory, visual evoked responses, psychoacoustics, neuroses, decision making and learning, as related to information processing in humans, are topics covered by the selected abstracts of research reports. This updated bibliography contains 118 abstracts, 64 of which are new entries to the previous edition. GRA

N80-17708*# Grumman Aerospace Corp., Bethpage, N.Y.
MANNED REMOTE WORK STATION DEVELOPMENT ARTICLE, EXECUTIVE SUMMARY Final Report
1 Mar. 1979 69 p
(Contract NAS9-15507)
(NASA-CR-160462; NSS-MR-RP008) Avail: NTIS HC A04/MF A01 CSCL 05H

The mission requirements for the manned remote work station (MRWS) flight article and the manned remote work station open cherry picker development test article is defined. Considerations are given for the near, mid, and far term use of the MRWS with emphasis on its ultimate application: constructing the Solar Power Satellite. R.C.T.

N80-17709*# Grumman Aerospace Corp., Bethpage, N.Y.
MANNED REMOTE WORK STATION DEVELOPMENT ARTICLE. VOLUME 1, BOOK 1: FLIGHT ARTICLE REQUIREMENTS. APPENDIX A: MISSION REQUIREMENTS Final Report
1 Mar. 1979 317 p
(Contract NAS9-15507)
(NASA-CR-160463; NSS-MR-RP008-Vol-1-Book-1) Avail: NTIS HC A14/MF A01 CSCL 05H

The requirements for several configurations of flight articles are presented. These requirements provide the basis to design manned remote work station development test articles and establish tests and simulation objectives for the resolution of development issues. Mission system and subsystem requirements for four MRWS configurations included: open cherry picker; closed cherry picker; crane turret; and free flyer. R.C.T.

N80-17710*# Grumman Aerospace Corp., Bethpage, N.Y.
MANNED REMOTE WORK STATION DEVELOPMENT ARTICLE. VOLUME 1, BOOK 2, APPENDIX B: TRADE AND DESIGN DEFINITION STUDIES Final Report
1 Mar. 1979 201 p
(Contract NAS9-15507)
(NASA-CR-160464; NSS-MR-RP008-Vol-1-Book-2) Avail: NTIS HC A10/MF A01 CSCL 05H

System trades, evaluations, and selection were organized under the appropriate manned remote work station roles and subsystems. Those trades/evaluations that have an impact on simulator fidelity were given emphasis in terms of identifying alternate concepts, making a selection, and defining the system approach. Those trades that do not impact simulator fidelity have the issues delineated and future study requirements identified.
R.C.T.

N80-17711*# Grumman Aerospace Corp., Bethpage, N.Y.
MANNED REMOTE WORK STATION DEVELOPMENT ARTICLE. VOLUME 2: SIMULATION REQUIREMENTS. APPENDIX A: OPEN CHERRY PICKER DEVELOPMENT TEST ARTICLES SPECIFICATION Final Report
1 Mar. 1979 132 p
(Contract NAS9-15507)
(NASA-CR-160465; NSS-MR-RP008-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 05H

A manned remote work station (MRWS) mission scenario, broken down into the three time phases was selected as the basis for analysis of the MRWS flight article requirements and concepts. The mission roles for the three time phases, supporting tradeoff and evaluation studies, was used to identify key issues requiring simulation. The MRWS is discussed in terms of its capability to perform such operations as support of Spacelab experiments, servicing and repair of satellites, and construction. Future considerations for the use of the MRWS are also given.
R.C.T.

N80-17712*# Grumman Aerospace Corp., Bethpage, N.Y.
MANNED REMOTE WORK STATION DEVELOPMENT ARTICLE. VOLUME 3: DEVELOPMENT TEST PLAN. APPENDIX A: MANUFACTURING REQUIREMENTS/ SCHEDULE Final Report
1 Mar. 1979 180 p
(Contract NAS9-15507)
(NASA-CR-160466; NSS-MR-RP008-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 05H

The tests and procedures for the manned remote work station (MRWS) open cherry picker (OCP) development test article (DTA) are described to validate systems requirements and performance specifications. A development test program is outlined to evaluate key design issues and man/machine interfaces when the MRWS OCP is used in a shuttle support role of satellite servicing and in orbit construction of large structures. R.C.T.

N80-17713# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
REFERENCE TREE NETWORKS: VIRTUAL MACHINE AND IMPLEMENTATION Ph.D. Thesis
Robert Hunter Halstead, Jr. 2 Jul. 1979 250 p refs
(Contract N00014-75-C-0661)
(AD-A076570; MIT/LCS/TR-222) Avail: NTIS HC A11/MF A01 CSCL 05/8

A current-technology computing machine may be roughly decomposed into a processor, a memory, and a data path connecting them. The interposition of this data path between processing and storage elements creates a bottleneck which inhibits progress at the high-performance end of the technological spectrum. Additionally, the monolithic nature of present-day processors resists incremental addition or removal of processing power. The research described here attacks the problem of constructing more powerful and more flexible computer systems along three fronts: the definition of a virtual machine providing for parallel computation using objects and object references, the development of a distributed implementation mechanism ('reference trees') supporting object management functions including garbage collection, and the investigation of scheduling algorithms and collection of performance results. A reference tree network using these concepts is composed of a multiple of independent small processors, yet operates as a coherent programming system. Programs and data spread automatically and transparently through the network to occupy underused resources. The modular structure of the network provides many parallel data paths as well as allowing for easy addition or removal of modules, thus addressing some of the problems discussed here. A prototype reference tree network, the Mu Ner, is currently in operation. GRA

N80-17714# Human Resources Research Organization, Alexandria, Va.

EFFECTS OF FATIGUE FROM WEARING THE AN/PVS-5 NIGHT VISION GOGGLES ON SKILLS INVOLVED IN HELICOPTER OPERATIONS Technical Report, 13 May - 29 Dec. 1978

Garvin D. Chastain and Albert L. Kubala Jul. 1979 51 p refs (Contract MDA907-78-C-2017; DA Proj. 2Q7-63743-A-775) (AD-A075426; HUMRRO-FR-WD-TX-78-18; ARI-RR-1217) Avail: NTIS HC A04/MF A01 CSCL 06/17

Reviews of the literature on rotary wing flight and interviews with aviators were conducted to determine which helicopter tasks and maneuvers are performed most frequently and/or are the most critical. Those operations found to be most critical were analyzed into perceptual and psychomotor components, and a battery of perceptual and psychomotor tests was selected to measure these factors. Aviators were tested both before and after flying with the AN/PVS-5 goggles. Eye-hand coordination was marginally affected following flight, and reaction time to lights was significantly affected. GRA

N80-17715# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

THE VISUAL SCENE PERCEPTION PROCESS INVOLVED IN MANUAL APPROACH LANDING

P. H. Wewerinke 13 Oct. 1978 87 p refs (Contract NIVR-1857)
(NLR-TR-78130-U) Avail: NTIS HC A05/MF A01

The outside scene is often an important source of information for manual control tasks. In the context of aircraft control the most importance example is the visual approach scene. Modeling the visual scene perception process on the basis of linear perspective geometry and relative motion cues is dealt with. Its impact on aircraft approach performance is investigated. Model predictions utilizing visual threshold data from baseline experiments and psychophysical literature of a variety of visual approach tasks are compared with the results of an experimental program. The results confirm that the visual scene may be assumed to provide a variety of cues among which the human operator has to divide his attention. Both the performance and workload results illustrate that the model provides a meaningful description of the outside world perception process with a useful predictive capability. Additional research, however, is warranted in order to be able to deal with the realistic, complex, time varying manual approach and landing situation. Author (ESA)

N80-17716# Massachusetts Inst. of Tech., Cambridge.

SUPERMAN: A SYSTEM FOR SUPERVISORY MANIPULATION AND THE STUDY OF HUMAN/COMPUTER INTERACTIONS M.S. Thesis

Thurston L. Brooks and Thomas B. Sheridan Jul. 1979 286 p refs
(Contract N00014-77-C-0256; Grant NOAA-04-7-158-44079) (PB-301290/3; MITSG-79/20; NOAA-79082405) Avail: NTIS HC A13/MF A01 CSCL 13J

The need for supervisory control of remote teleoperator vehicles in the ocean environment is considered and it is shown that computer controlled systems can increase the effectiveness of remote manipulation. A distinction is made between absolute tasks--tasks which have a known spatial relationship to the manipulator base prior to execution--and relative tasks-tasks which cannot be spatially defined prior to execution. Based on the mathematical and theoretical foundations described, a supervisory system was developed and demonstrated. GRA

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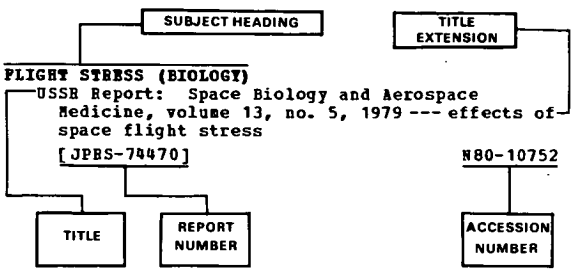

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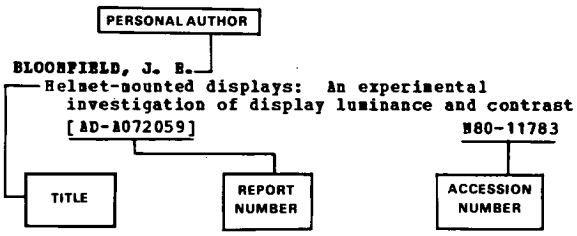

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